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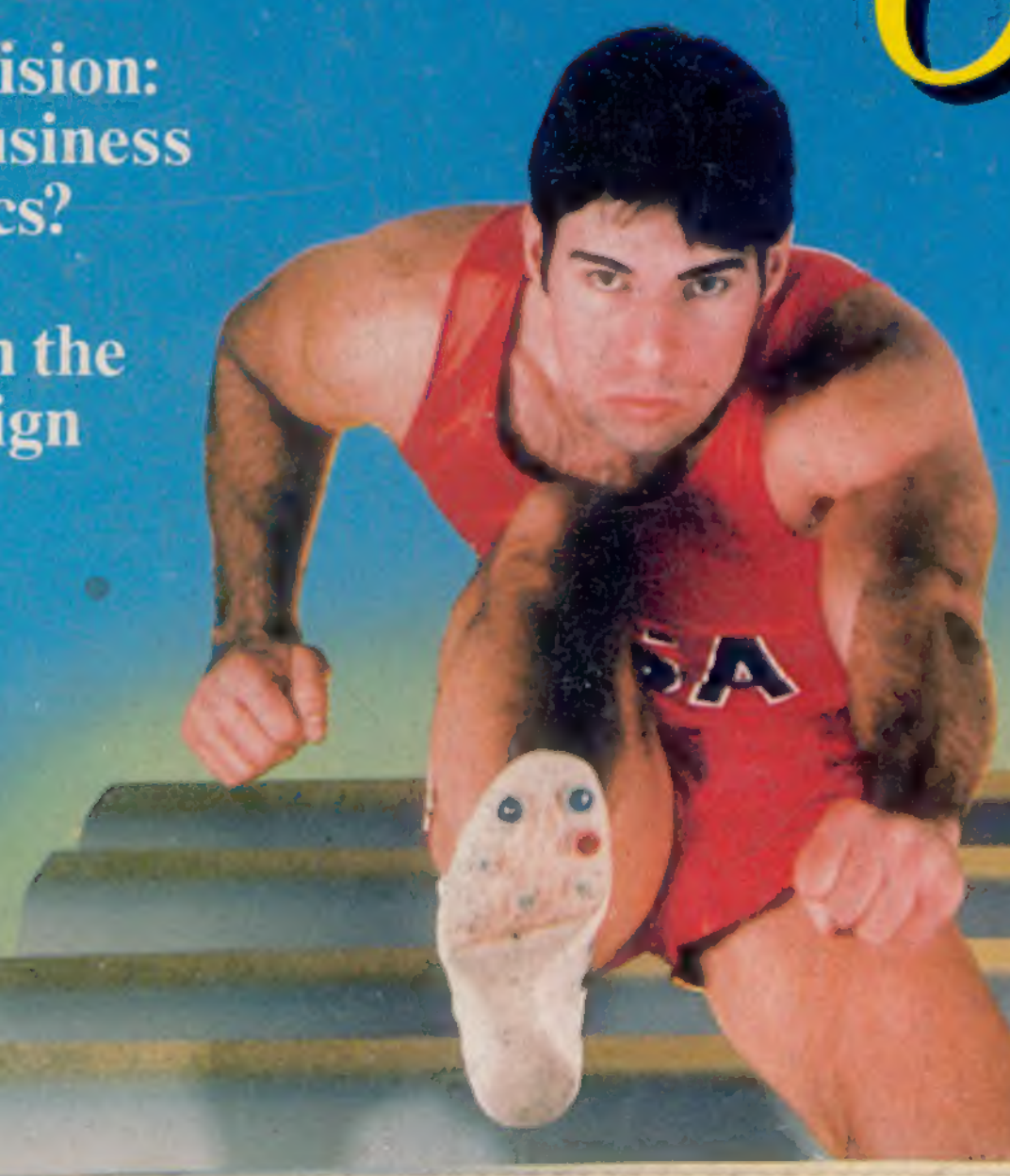

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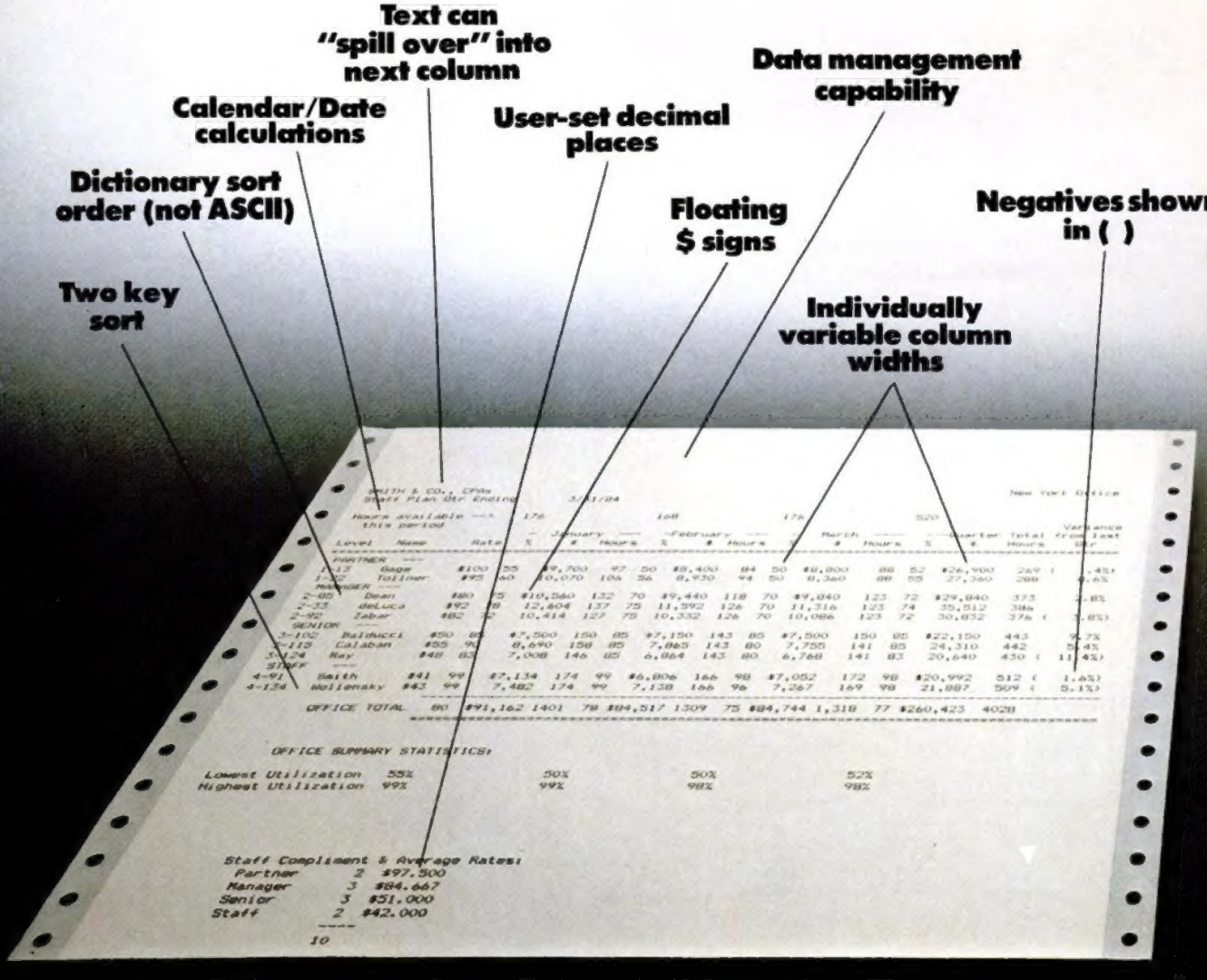

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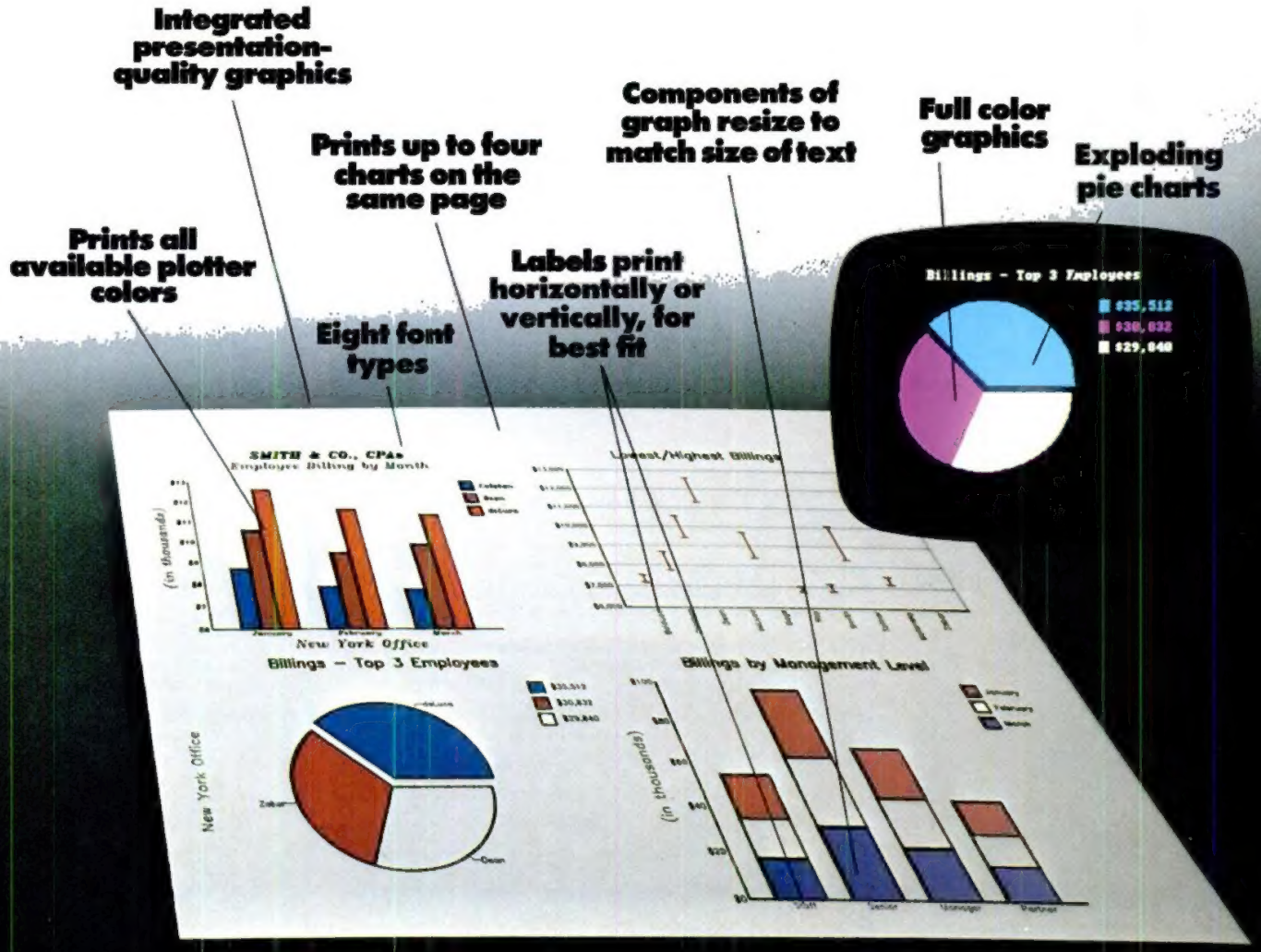

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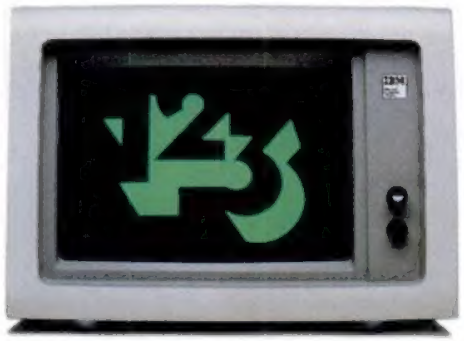

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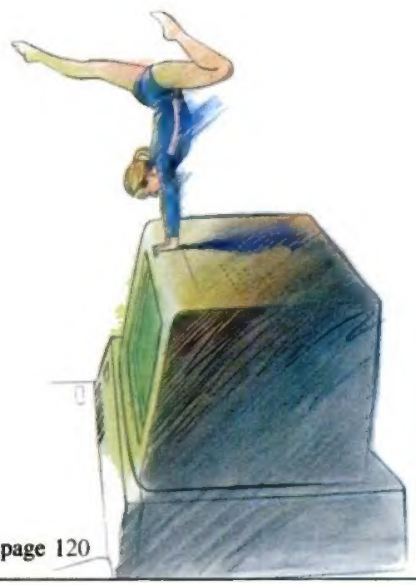

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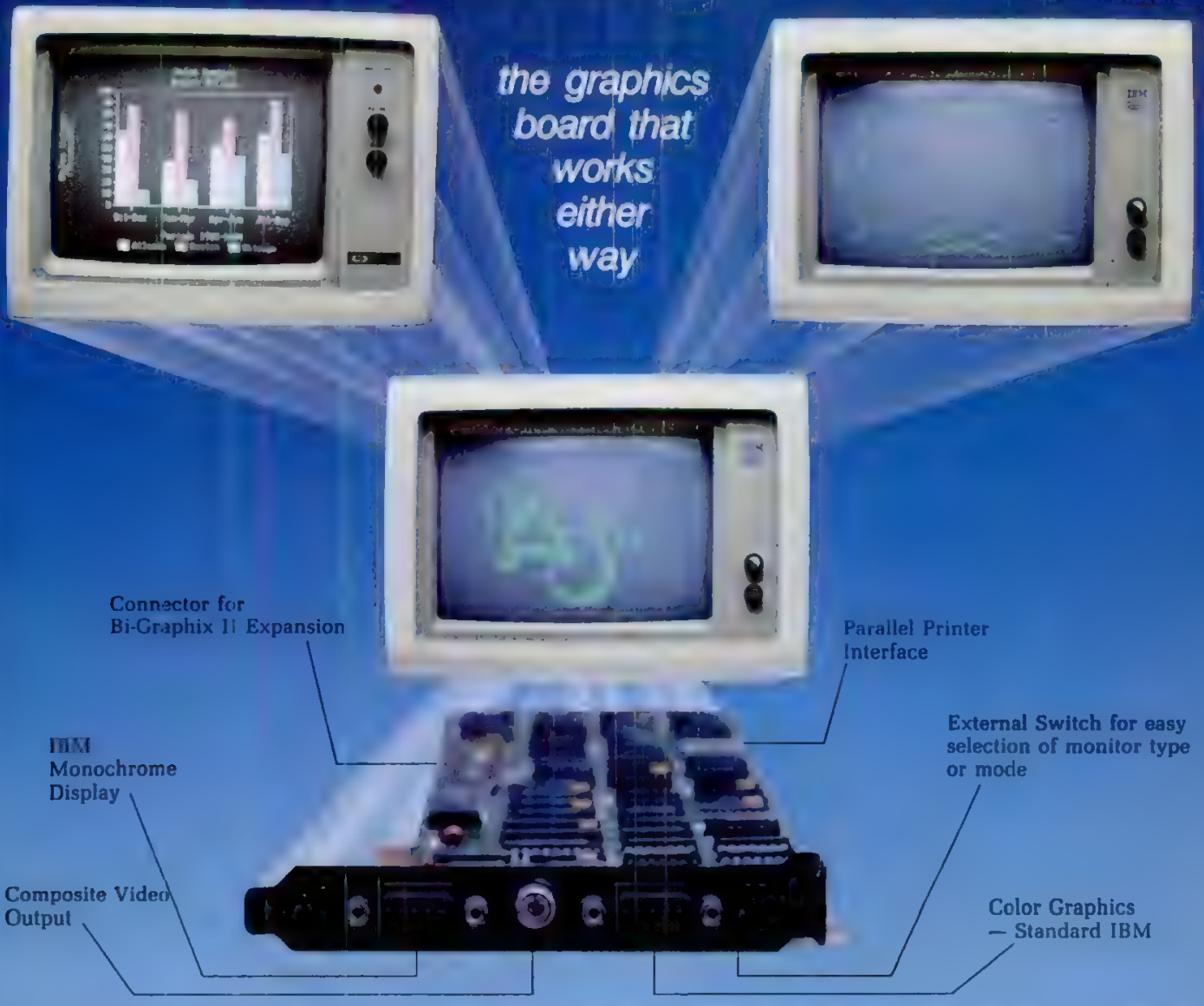
CIRCLE 428 ON READER SERVICE CARD

Bi-Graphix



Bi-Graphix I replaces both the IBM Monochrome Display/Printer Adapter and the Color/Graphics Adapter Card. It will also allow graphics to be displayed on the IBM Monochrome Monitor.

No modification is needed to run standard graphics software on the IBM Monochrome Display.

Monitor and mode selection is done easily by the flip of a single external switch. With two 9 pin output connectors you can have the IBM Monochrome Display and a color monitor connected simultaneously. Switching between the two monitors can be performed through software.

With **Bi-Graphix I** you can run Lotus 1-2-3 with the IBM Monochrome display, and enjoy the benefits of superior text quality and graphics without sacrificing compatibility.

Bi-Graphix II is a piggyback card with 128 k of memory. By installing Bi-Graphix II onto Bi-Graphix I you will be able to reach resolutions of 640 X 400 in 16 colors, using any standard high resolution color monitor. Resolutions of 720 X 700 can be attained on the IBM Monochrome Display.

FEATURES

Bi-Graphix I

- Standard IBM graphics modes
- Standard IBM Monochrome text
- IBM Monochrome Display Graphics
- Upgradeable for higher resolutions

Bi-Graphix II

- 640 X 400 16 colors with Color monitor
- 720 X 700 IBM Monochrome Display
- Software support for higher resolution
- Piggy-Back onto Bi-Graphix I, so no need for an extra slot.

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PGS is a trademark of Princeton Graphics System. Bi-Graphix I and Bi-Graphix II are trademarks of PC components

CIRCLE 120 ON READER SERVICE CARD

Your IBM PC Deserves Davong MultiLink

You can do a lot with an IBM® PC, but think how much more you could do with access to the pooled resources of IBM PC users throughout your organization. You could share information and programs. Communicate with other users. Make use of larger data storage. And all at a lower cost per user.

With the Davong Multilink™ local area network, up to 255 IBM PC and PC-XT computers can share hard disk resources.

Anyone in the network can access hard disks attached to specified "File Server" computers. Although a user can operate a File Server computer as if it were a stand-alone unit, others in the network can access the File Server's hard disk storage, subject to network control and security.

It's fast, too—2.5 megabit with node-to-node token passing taking only 28 microseconds. You'll hardly realize you're running on a network instead of your own hard disk.

Davong makes networking practical. A large network (200 users or more) costs less than $700 per workstation. Ask about our OEM and quantity discounts. Available through more than 800 computer dealers. Don't you and your computer deserve Davong MultiLink?

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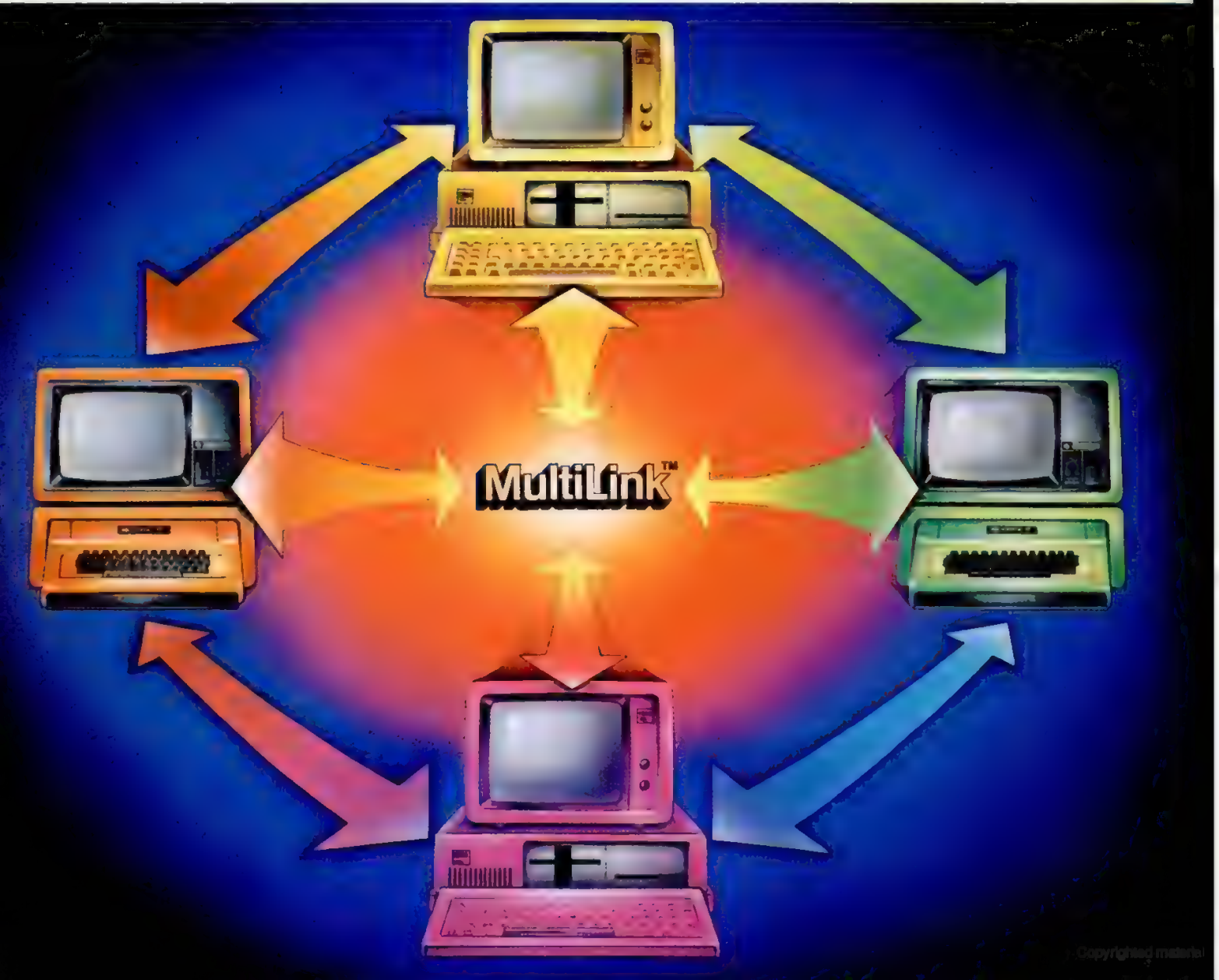

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What's Inside

In this issue, PC flexes its muscles and brings you stories on everything from distance running and the Summer Olympics to writing romances and getting elected.

This summer's Olympic games in Los Angeles should prove to be one of the greatest logistical and administrative challenges of all time. Consider how clogged and difficult the L.A. area is even under the best of circumstances, and then imagine it stuffed with thousands of international athletes, bureaucrats, and TV crews, not to mention millions of spectators. The great hope for bringing order out of this chaos is the IBM PC. Big Blue donated more than 100 machines to the Los Angeles Olympic Organizing Committee, including large business systems as well as IBM micros. With this gear, everyone should be able to get where they need to go when they need to be there. Tickets will match seats, athletes will match their Olympic Village rooms, and the most spectacular event in world sports will go off without a hitch. West Coast contributor Vanessa Schnatmeier provides this issue's detailed report on how the PC will be the machine behind the men and women at this summer's games.

PCs aren't limited to helping world-class performers. They can help us ordinary folk work on our diet and exercise programs so that we might become a bit more Olympian ourselves. Famous running expert Jim Fixx, for instance, is going into the PC software business with a product to help distance runners train. Fixx uses a PC himself, as our profile by

contributing editor Martin Porter reveals. And as for diets, some half-dozen PC products compete for the right to tell you what you should eat, when, and why. In this issue, nutritionist Marilyn Schorin examines low-cal special software.

Now that we've talked sports, let's talk politics. PCs are playing an important role in this area, too. At national, state, and local levels, candidates are using PCs to keep track of voters, raise money, send mailings, and for many other campaign chores. Michael Muskal, a longtime political reporter and regular contributor to *PC*, reviews two new political software products for the PC and discusses the role PCs play in local campaigning. In a related article, Martin Porter uses John Glenn's quest for the Democratic presidential nomination to demonstrate how PCs are used at the national level. And our new associate editor Barbara Krasnoff looks into how PCs can help political activism at the grass-roots level.

This issue also features something a little bit new and different for *PC*— a detailed hands-on, how-to hardware story. By following the instructions in Laurence Mark's article on real-time clocks for the PC, you'll be able to install one yourself and do away with the annoying fixed-time aspect of the standard model. We hate having to constantly update time notations on our PCs, and this straightforward approach to solving the problem is just a sample of the kind of technical help we plan to bring you in the issues ahead.

On the lighter side, we visit pulp fiction writers who use PCs to concoct plots, and we look at how one of the world's biggest PR firms is burnishing its image by using PCs. Reviews in this issue cover the nifty new TI Professional Computer, Microsoft's *Budget*, and *Execuvision*, a very powerful presentation graphics system that impressed even our art directors. Putting out *PC* every 2 weeks is a race, we admit, but we think this Olympic-centered issue is in pretty good shape. We hope you agree. ■

The new 384K Quadboard by Quadram is the most comprehensive board you can buy for the IBM PC or XT. Now with added hardware features and advanced software. But our same low price.

NEW EXPANDED QUADBOARD
Quadboard now delivers 9 of the most needed PC functions/features. To let you get the most out of your Personal Computer. And help you work better and faster.

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- **Serial Port:** Throw a Serial Port, too. Fully programmable, use it to connect to plotters, moderns, and other serial devices.
- **Chronograph:** And Quadboard's Chronograph (Real-time clock/calendar) keeps your system's clock up-to-date.
- **Game Port:** The new Quadboard has an IBM compatible Game Port. Plug in a joystick or game paddles, and fire away.
- **I/O Bracket:** Quadboard now comes with a special I/O bracket. Use it to organize your expansion port connectors. Snaps right onto the back of the PC.

EXPANDABLE TO 384K

THE WORLD'S BEST SELLING MULTIFUNCTION BOARD IS NOW EVEN BETTER

$295
Socketed with no RAM installed

QUADBOARD®

• **Expandable to 384K:** The new Quadboard is expandable in 64K increments for up to 384K additional RAM. With full parity checking standard. With the new Quadboard and a fully populated system board, you can take your PC's memory up to the 640K limit.

• **QuadRAM Drive:** Plus, with Quadboard you get advanced QuadMaster Software. Including the QuadRAM Drive program. Use it to set up multiple RAM Drives in Quadboard memory. Solid state drives that let you store and retrieve data quickly and easily. Or take advantage of QuadMaster disk caching. To access frequently used data whenever you need it.

• **MasterSpool:** QuadMaster Software also includes MasterSpool. Use it to set up a software print buffer quickly and easily. This advanced spooler lets you pause at any time, back up or move forward in a file. Choose just the amount of buffer space you need and stop waiting on your printer.

• **Qswap:** Another feature of QuadMaster Software is Qswap. With Qswap change line printers 1 and 2 back and forth, with just a few keystrokes, as often as you like.

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Now more than ever Quadboard is the first and only board your IBM PC or XT may ever need. No other board even comes close. Because Quadboard is designed for performance. Engineered for dependability.

And built in the continuing tradition of Quadram Quality.

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There are many imitators, but only one leader. So make sure you ask for Quadboard by Quadram, the leader in micro-computer enhancement products.

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Features/ Functions	Quadboard	SixPakPlus
Memory Available	0-384K	0-384K
Parallel & Senal Port	Yes	Yes
Clock/ Calendar	Yes	Yes
I/O Bracket	Standard	Optional
Game Port	Standard	Optional
Diagnostic Testing	Yes	Yes
Advanced Spooler	Yes	No
Simple Menu Setup	Yes	No
Disk Cache	Yes	No
LIST PRICE WITH 384K*	$795	$970

*Manufacturer's suggested list price for board with all available features/functions as shown (options included)
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CIRCLE 327 ON READER SERVICE CARD

Introducing COMPAQ PLUS, the first high-performance portable personal computer.

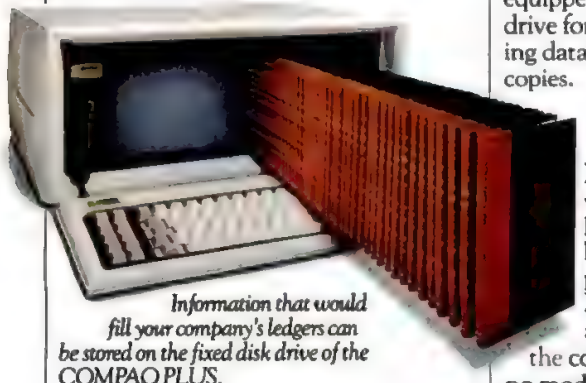
The makers of the COMPAQ™ Portable Computer, the industry standard, announce another breakthrough—the COMPAQ PLUS™ Portable Personal Computer. No other personal computer can handle so much information in so many places.

The new COMPAQ PLUS offers the power of an integrated ten-megabyte fixed disk drive in a portable. You get problem-solving power that no other personal computer can match.

Plus a bigger payload

How much is ten megabytes?

Enough to tackle jobs that can't be conveniently handled on most personal computers.



Information that would fill your company's ledgers can be stored on the fixed disk drive of the COMPAQ PLUS.

A mailing list of 100,000 names, addresses, cities, states, and Zip codes.

A full year of daily prices for every stock on the New York exchange.

Inventory records on a quarter million items.

The entire San Francisco phone book. And room left over for Peoria.

The fixed disk drive keeps all the information seconds away, ready to be searched, sorted, retrieved, analyzed or updated.

Plus better use of your time

The integrated fixed disk drive will store programs. That means your most used programs and data can be permanently kept in the COMPAQ PLUS, ready to call up and run.

With programs permanently stored, the COMPAQ PLUS becomes a well-informed traveling companion, a tool to help you apply your best thinking anytime, anywhere.

You could store a complete library of accounting programs on the disk—payables, receivables, general ledger, and payroll—*with* the company's books.

You could store an inventory control program with your inventory records and a list management program with your mailing list and a filing program with your personnel files.

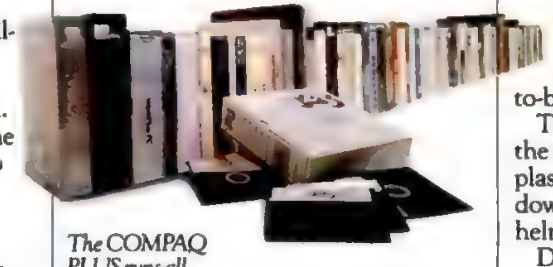
The COMPAQ PLUS is also equipped with a 360K byte diskette drive for entering new programs, copying data files, and making backup copies.

Plus more programs

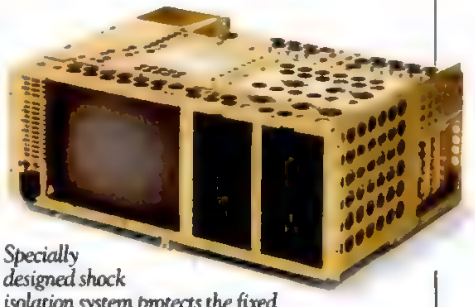
More programs means more versatility. And the COMPAQ PLUS is impressively versatile because it runs all the popular programs written for the IBM® Personal Computer XT, available in computer stores all over the country. And they run as is, with no modification whatsoever.

And the high-capacity portable multiplies the productivity of every program it runs. Your inventory and its control programs can go with you to the factory. Your books and your accounting programs can go with you to a board meeting. Your building specs and your project management programs can go with you to the construction site.

You're buying a computer to solve problems. Why not have more problem-solving programs to choose from?



The COMPAQ PLUS runs all the popular programs written for the IBM Personal Computer XT.



Specially designed shock isolation system protects the fixed disk from jolts.

Plus a traveler's toughness

Life can be tough on the road. A true portable has got to be tougher. The COMPAQ PLUS is.

Its integrated fixed disk drive is unique, designed specifically to travel. Rough roads and hard landings don't bother it because of a specially designed shock isolation system that protects the disk from jolts and vibration.

All the working components are surrounded by a uniquely cross-membered aluminum frame. This structure, common in race car design technology, strengthens it side-to-side, front-to-back, and top-to-bottom.

The outer case is made of LEXAN®, the same high-impact polycarbonate plastic used to make bulletproof windows and faceplates for space suit helmets.

Does a portable personal computer really have to be this tough? Take a good look at your briefcase and then decide.

Plus ease of use

The COMPAQ PLUS is big where it counts.

The display screen is big. Nine inches diagonally. Big enough to show a full 25-line-by-80-character page that's easy to read even if you're leaning back in your chair.

The keyboard is full-sized and typewriter-style for easy control.

With its built-in display, the COMPAQ PLUS makes a smooth, low profile on your desk, not an obstacle that you have to talk around.

Plus an easy way to get started

If you're buying your first personal computer and you're not sure how much capacity you need, your choice is easier now.

Start with the COMPAQ Portable with single or double 320K byte diskette drives. If you need more capacity later, upgrade to the COMPAQ PLUS. A conversion kit is available that turns the COMPAQ Portable into a COMPAQ PLUS, complete in every detail and capability.

Plus a lot more

The COMPAQ PLUS also works with optional printers, plotters, and communications devices designed for IBM's personal computer family.

It has two IBM-compatible slots for adding optional expansion boards. With companion programs, they'll let you share information with a network of personal computers in your office, communicate with your headquarters computer files while you're away, or add memory capacity if your needs grow.

The COMPAQ Portable, the industry standard in portable personal computers. ▼

The problem-solving power of a high-performance desktop personal computer can now go where you need it.

It's got high-resolution graphics and text on the same screen. A detached keyboard. Programmable function keys. Expandable memory. Dozens of other features that simply make it do a better job of personal computing.

And when you see all that the COMPAQ PLUS has to offer, you'll be pleasantly surprised by the price. The fact is, it costs hundreds less than comparably equipped desktop personal computers.

See the first high-performance portable personal computer. The COMPAQ PLUS—performance, programs, productivity. Plus problem-solving power.

The new COMPAQ PLUS, the first high-performance portable personal computer. ▼

COMPAQ PLUS Specifications

Storage
- ☐ One integrated 10-megabyte fixed disk drive
- ☐ One 360K byte diskette drive.

Software
- ☐ Runs all the popular programs written for the IBM XT.

Memory
- ☐ 128K bytes RAM, expandable to 640K bytes

Display
- ☐ 9-inch diagonal monochrome screen
- ☐ 25 lines by 80 characters
- ☐ Upper- and lowercase high-resolution text characters
- ☐ High-resolution graphics

Interfaces
- ☐ Parallel printer interface
- ☐ RGB color monitor interface
- ☐ Composite video monitor interface
- ☐ RF modulator interface

Expansion board slots
- ☐ Two IBM-compatible slots

Physical specifications
- ☐ Totally self-contained and portable
- ☐ 20"W × 8½"H × 16"D

For the name of the Authorized Dealer nearest you, call 1-800-231-0900.

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An Industry First in Word Processing Software:

WordPlus-PC™ featuring the BOSS™. Word processing so smart it can even spell 100,000* words.

Meet the BOSS. WordPlus-PC's incredible new Built-in On-line Spelling System.

WORD PROCESSING AND SPELLING COMBINED:

WordPlus-PC featuring the "BOSS" is a whole new technology in word processing software. Finally, the most powerful word processing capabilities have been combined with a built-in electronic spelling system which not only *checks your spelling* but also *corrects your spelling.*

The "BOSS", an acronym for Built-in On-line Spelling System, eliminates embarrassing spelling errors in your letters and stops time consuming trips to the dictionary.

But WordPlus-PC featuring The "BOSS" will do far more than just check and correct your spelling. It's been designed to be exceptionally easy to use and yet contain all the powerful features you expect and more. Like built-in mail merge for personalized form letters, invoice generation and the ability to merge information created by most other popular programs such as 1-2-3™ and dBASE II!™ And if you have a question, just press the HELP key to get back on track.

You can also print bar graphs and other charts,** easily move columns, scroll horizontally, execute global search and replace, boilerplate text, and even print proportionally spaced on selected printers. And WordPlus-PC is compatible with virtually all popular letter-quality and dot matrix printers.

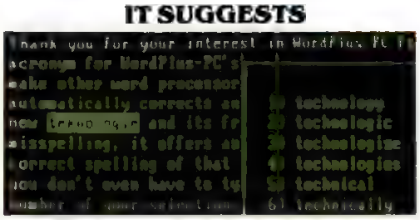
*With 90,000+ word standard dictionary and ability for a user to add over 10,000 "custom" words.

HERE'S HOW THE BOSS WORKS FOR YOU:

IT CHECKS

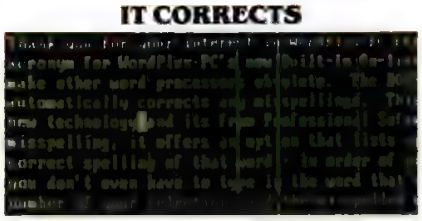
At the touch of a button, virtually anytime during typing or after the creation of a document, The "BOSS" locates and *highlights misspelled words* on your screen. The "BOSS" can even check the spelling of a word directly after it's been typed in.

IT SUGGESTS



When a word is misspelled, the user can ask The "BOSS" for suggestions as to how to correctly spell the word. With only one keystroke, The "BOSS" will display, in a dynamic on-screen window, up to eight *spelling suggestions in the order of probable phonetic correctness.*

IT CORRECTS



And The "BOSS" *Auto Correct* feature enables users to "fix" these misspelled words directly in text with a single keystroke. The "BOSS" is a total spelling system that Checks, Suggests, and Corrects your Spelling. All built-in.

THE TOTAL WORD PROCESSING SOLUTION — PLUS ALL THE HELP YOU'LL NEED.

With over 70,000 word processors in use worldwide, Professional Software, Inc. has designed WordPlus-PC to contain all the powerful features you expect — and to be the easiest word processor to use anywhere. But there will always be questions. That's why Professional Software has an entire bank of Nation-wide TOLL FREE customer HELP lines to support our registered users. This service is available at No Charge during the 90 days following the receipt of your registered users card.

Demand to see the BOSS in person
Visit your local professional computer dealer or call us toll free for the dealer nearest you. Once you witness the BOSS in action, you'll see that all other word processors have become totally obsolete.

Demand to see the "BOSS" today! Call us toll free, 1-800-343-4074.

Professional Software, Inc.

51 Fremont Street, Needham, MA 02194 Telephone (617) 444-5224 Telex 951579
Now Available for IBM-PC and Compatibles, DEC Rainbow, TI Professional, and Victor 9000.
Dealer, distributor, OEM manufacturer, and international inquiries are invited.

WordPlus-PC and The "BOSS" are trademarks of Professional Software, Inc.
1-2-3 is a trademark of Lotus Development Corp., dBASE II is a trademark of Ashton-Tate.
Specifications are subject to change without notice.

WordPlus-PC was designed and written by Andres Escallon.
**With IBM dot matrix and Diablo 630 ECS printer, bar graphs and other charts can be printed inside text.

CIRCLE 374 ON READER SERVICE CARD

QuadDisk™ by Quadram™

Quadram™ presents QuadDisk.™ The new hard-disk system.

QuadDisk gives you maximum storage capacity in the limited space you've got. Turning your IBM™ Personal Computer, PC XT, Compaq,™ Chameleon,* or Eagle* computer into a micro powerhouse.

Choose from 6 to 72MB Fully Integral

QuadDisk comes in 6, 12, 20, 27, or 72 megabyte capacities. All integral to the computer for fast, convenient data access. And for added flexibility, there's QuadDisk with removable cartridges. For up to 6MB on-line storage plus added data security. (Not to mention virtually unlimited off-line storage.)

QuadDisk comes complete with disk controller board for total system integration.

Keep your personal computer personal

QuadDisk delivers all this power without turning your computer into a main frame. QuadDisk is compact. It installs in the same space as your floppy unit to become part of your system. Ready to work with your system.

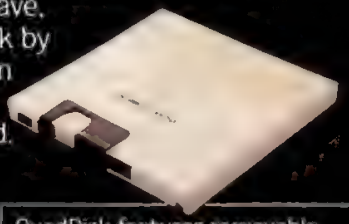
By showing off its power, not its size, it keeps your personal computer personal.

Winchester technology made easy

But for all its power, this is one memory system that doesn't forget you're human. So QuadDisk comes with a virtual memory (RAM Drive) and a print spooler. Plus, QuadDisk's File Utility. To copy, rename, erase, and execute programs straight from a menu. Without using complex DOS commands.

Quadram Quality

Every QuadDisk comes stamped with the Quadram Quality seal. The mark of dependability and performance from the leader in microcomputer enhancements. So visit your local computer retailer today. Ask to see QuadDisk in action. When a little space is all you have, QuadDisk by Quadram is all you need.



QuadDisk features removable cartridges which give you unlimited off-line storage. It's Winchester technology made easy.

QUADRAM CORPORATION

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CIRCLE 521 ON READER SERVICE CARD

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As much storage capacity as you need, in as little space as you've got.

WHEN YOU NEED A DEPENDABLE DISKETTE, LINE PRINTER PAPER & LABELS DON'T SETTLE FOR LESS THAN THE BEST!

As low as $2.47 each

VERBATIM 5 Year Warranty

BASF Life Warranty-Black Box, One Year Warranty-Orange Box

Description	Compatibility	BASF Orange Box 1 Year	Box of Ten Each Disk	BASF Black Box LIFE TIME	Box of Ten Each Disk	Verbatim Soft Box 5 Year	Box of Ten Each Disk
5-1/4" single-side, single-density, soft sector	Apple II, Commodore, Radio Shack TRS-80	54256	$2.47				
5-1/4" single-side, double-density, soft sector	IBM PC (single-side), Apple II, Commodore, TRS-80 Model III	54968	2.47	54974	$2.81	MD525-01-18138	$2.66
5-1/4" double-side, double-density, soft sector	IBM PC (dual side)	54624	3.50	54980	3.74	MD550-01-18188	4.10
8" single-side, single-density, soft sector IBM Format 2305830	Radio Shack TRS-80 Model I	53428	2.55	54998	3.06	FD34-1000-3718	2.66
8" single-side, double-density, soft sector	Radio Shack TRS-80 Model II			54021	3.23	FD34-8000-18137	3.40

Description	Part Number	1 to 4 Cases	5 to 9 Cases	10 or More Cases
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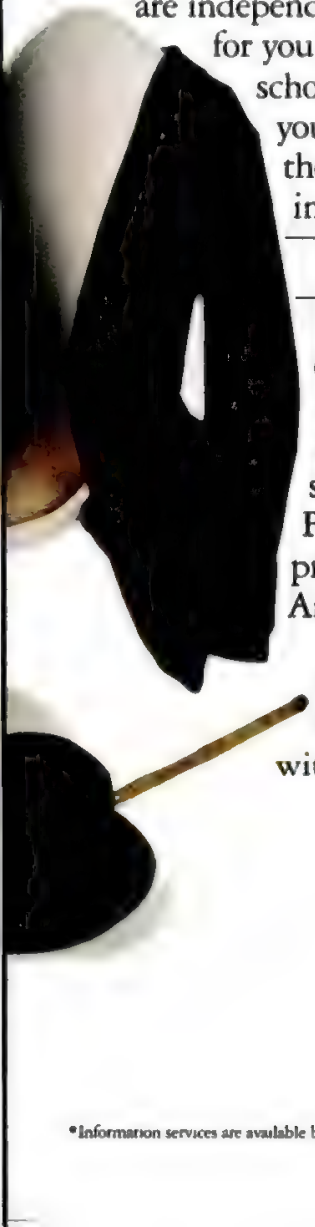

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At home, for example, you can shop through an electronic catalog. Access mortgage amortization and tax depreciation schedules. Study the wines of France, the foods of Italy. Find property to sell, rent, swap or share. And play hundreds of games.

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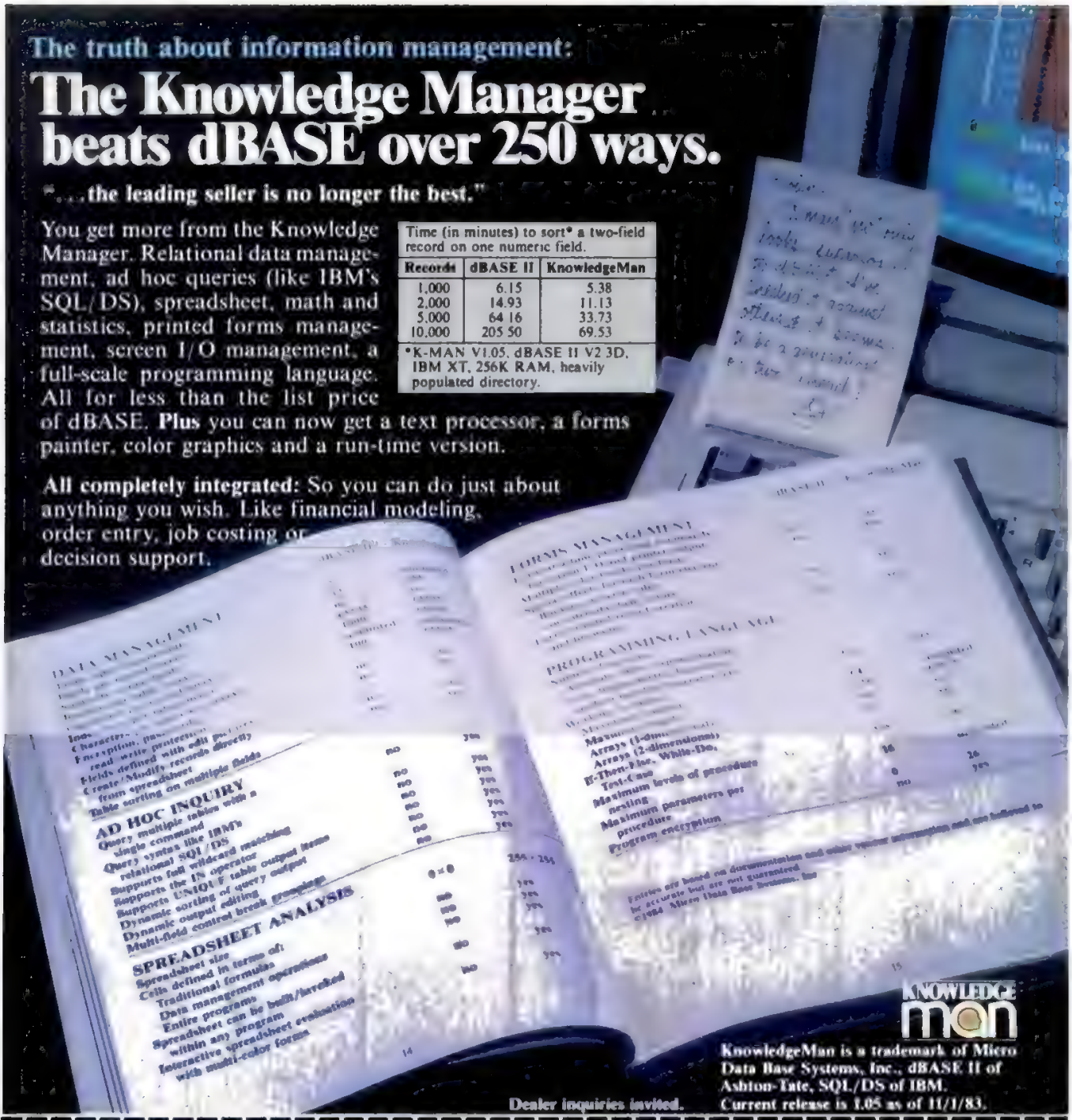

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It was able to run all IBM compatible software.

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But when you get there late, you'd better have something important to bring to the party.

To see how the Sperry PC can work for you and for your free copy of the Micro Software Catalogue, write Sperry Corporation, Computer Systems, Dept. 100, P.O. Box 500, Blue Bell, PA 19424. Or call 800-547-8362.

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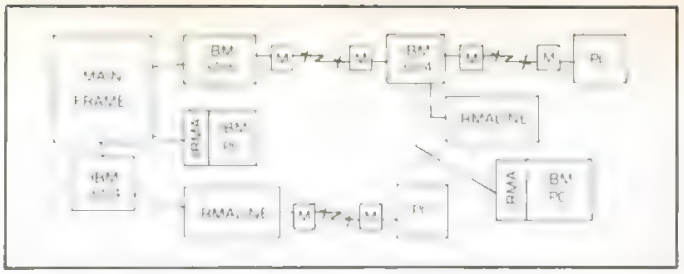

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CIRCLE 117 ON READER SERVICE CARD

Trends and Developments of IBM Personal Computers

IBM News

FROM THE EDITORS OF PC

MARCH 6, 1984

Jr. Sneaks PC into Home

Developers at Consumer Electronics Show hope IBM's PCjr will support big markets for educational, business software

BY KAREN COOK

A funny thing happened to PC*jr* on its way to the market: Instead of riding on the PC's coattails, it appears that *jr* may be the machine to lead PC into the home software market. At the Consumer Electronics Show (CES) in Las Vegas, many software makers were promoting packages that were aimed at *jr* buyers first—and PC owners second.

"Before, we weren't even considering publishing for the IBM because the PC was too expensive. Now, as long as we're converting software for the PC*jr*, we might as well convert for the PC as well," says Jay Stevens, senior staff engineer for HesWare, a Brisbane, California, software publisher.

CES is traditionally a glitzy showcase for televisions, radios, stereos, watches, and other consumer products. This year, 217 computer-related companies —up from 35 last year— turned out to make the case that computers can be just as useful, informative, and entertaining as the family TV.

Much of the home computer industry's conviction is fueled by IBM's introduction of the PC*jr* last fall. "IBM lends credibility to the market," acknowledges Myron Jones of Commodore International, which introduced a new model, the Commodore 264, at the show. With a $1300 price tag for a disk-based system, IBM's PC*jr* could bring some price stability to the chaotic home computer market, observers say.

Low profit margins made 1983 a difficult year for home computer manufacturers. Although Commodore did splendidly with its Commodore 64, price wars caused big losses at Atari and knocked Texas Instruments out of the home market entirely.

"The price wars must end for everyone's sake," says Don Kingsborough, president of Atari, Inc.'s sales and distribution company. "If consumers see a computer for $100, they assume it's an inferior machine." By refusing to sell the PC*jr* through retailers like KMart or general electronics stores, IBM has shown its determination to steer clear of discounting.

Expanded Applications

By introducing PC*jr*, IBM has opened up a whole new source of software for its computers. Many of the companies announcing plans for PC*jr* software at CES were companies that had never touched IBM machines before, working instead with Commodore or Atari.

In addition, projections of 800,000 units in first year

(continued)

IBM Sailing towards Unix for Next PC

Will "Popcorn" come in on the "Nina," the "Locust" or the "Santa Maria"?

BY CONNIE WINKLER

NEW YORK—IBM Corp. has announced a Unix-based operating system for the PC which will allow multi-users in the office to do multi-tasks—on a PC not yet out. Available in April for a flat $900 (through IBM's big accounts division) the Personal Computer Interactive Executive system was announced unexpectedly after press reports that such an anti-AT&T product was in the works.

What's less clear—and sometimes downright funny —is IBM's internal code names for these operating systems and machines.

● "The 'Locusts' are com-

(continued)

Jr. Sneaks *(continued)*

sales for PC*jr* promise a large enough base of computers to attract a wide range of established software publishers. By the end of 1984, "home computer" will no longer be synonymous with "game machine," industry observers believe... and hope.

"People take the computers home, then discover they don't want to play games forever," says Stevens of HesWare. Kingsborough of Atari agrees: "You need meaningful uses for computers, like self improvement and education."

Words like that from a company renowned for its games mean that a sea change is underway. Many games manufacturers, looking for products with a longer shelf life than games —whose popularity can peak in a matter of weeks— have opted to produce educational programs instead.

"Our present mix of software is 85 percent entertainment, 15 percent education and home productivity software, but we plan to shift to about 45 percent arcade games, with the balance in education and home productivity software," says Stewart Bloom, director of product development for Datasoft, Inc., a Chatsworth, California, arcade game manufacturer. The educational software market is expected to mushroom from $120 million to as much as $2 billion by 1990.

The products probably slowest to develop for the PC*jr* are those that were not traditionally made for low-end computers—business programs and self-improvement plans. "There is a lot of demand for business software," says Stevens of HesWare. Until recently, however, there weren't enough machines at home to justify the expense of making business programs for them. The PC*jr* may change all that. "The PC*jr* has a headstart in business software because so many companies already have business software for the PC. It should be fairly easy to convert for PC*jr*," Stevens says.

Sophisticated Pitch

As part of this new seriousness in the home computer market, the computer booths at the Las Vegas Convention Center seemed subdued next to the hoopla surrounding video or car stereo exhibits. There were no Penthouse pets, dance teams, or parrots at the software booths. "The image wouldn't work for us," sighed a woman at Scholastic, Inc.'s booth when a model nicknamed "Ample Annie," who was shivering in her leotard, wandered by.

For the most part, the software booths were staffed by serious-looking men and women attired in dark blue suits. At CBS Software, an army of demonstrators stood by, ready to demonstrate the company's 33 new titles. "Last year, our booth was one-tenth this size," commented Barry Schwartz, head of the company's public relations firm. "The size of this year's booth shows that CBS is making a major commitment to electronic publishing."

Like any publisher, CBS is trying to build a stable of well-known authors of software. For its line of educational software, CBS has signed contracts with the Children's Television Workshop (creators of Sesame Street) and Fred Rogers of "Mr. Rogers' Neighborhood."

"We think the software business is where TV programming was in the early 1950s, and we want to be number one," Schwartz says. The company plans a $4-million budget to advertise its 33 programs "in magazines ranging from *Good Housekeeping* to *PC*."

Exhibit visitor Evelyn Tratnyek, a sixth-grade teacher from Chino, California, applauded CBS's effort. "It used to be that educational programs were really just a lot of colors and clever graphics. Now that they're starting to bring in education people to help design them, things are looking a little better."

At the Spinnaker Software booth, company president C. David Seuss was looking pleased with himself. So far, he says, his Cambridge, Massachusetts, company is the only software maker actually shipping products for PC*jr*. "IBM gave us the go-ahead to start shipping at 10:30 a.m. on the fifth of January, and we started mailing packages at 4:22 p.m.," Seuss reports with delighted precision.

Disk Preference

Seuss hems and haws when asked if there were problems in translating software for IBM's newest machine. "One thing I will state: The PC*jr* has fewer hardware and software flaws than the PC did when it came out." Seuss expects to sell most of his company's packages on disk, although Spinnaker is also making cartridges. "What do you do with a $600 cartridge machine?" he asks. ROM cartidges load faster than disks.

Timex Eager Beavers, Help Is on Way

Are you hesitant about buying an IBM PC because you don't want to lose an investment in software and data files that you created on your Timex 1000? Good news! Now you can make a fresh start, thanks to a service offered by Personal Computer Products (1400 Coleman Ave., C-18, Santa Clara, CA 95050). Just send them your Timex/Sinclair cassette tapes and they'll send back your BASIC programs and data files on diskettes that can run on your PC.

We didn't think there'd be many people making the switch from the world's cheapest computer to an IBM. But Alan Heimlich of Personal Computer Products found a real demand for Timex-to-IBM conversions. "A lot of businessmen bought the cheap Timex to see what computers were like," he said. "Some went hog wild and used Sinclair BASIC to write programs—some as big as 48K—for their businesses. Timex provided a tiny spreadsheet program, and people used it to write files of personal financial data. Later, they wanted to use them with *VisiCalc* on the PC."

How can a program for the toy-like Timex compare with those that run on the business-class IBM machine? "Clive Sinclair designed his version of BASIC for speed," Heimlich said. "Some users are going to be disappointed when they use the IBM to run their programs." ■

but don't have enough storage capacity to run sophisticated programs.

Datasoft Inc. expects to convert three action games —*Juno First*, *Genesis*, and *Pooyan*—for the PC*jr*. Most likely, those games will be sold on "intelligent-loading disks" that will operate on either the *jr* or the PC. Don't look for the new versions before next summer, however. "We'll wait to see how PC*jr* goes off first," says product manager Mitch Junkins.

"We sell no wine before its time," jokes Bloom, who says he likes PC*jr*. "IBM has earned its reputation because of quality," he comments. "Not even Cadillac's name could sell a Pinto for $25,000."

MECA (Micro Education Corporation of America) is also working to convert products for the PC*jr*, including Jim Fixx's running schedule program and Andrew Tobias' *Managing Your Money*.

Commodore Hold

On the other hand, a spokesperson for Imagic of Los Gatos, California, which announced four games for the PC*jr*, thinks many consumers will stick with Commodore. "It's a lot faster and it sells for one-third the price," he says. "For PC*jr*, the question is whether sales will be merely OK—or very good."

Those consumers who get their hands on the PC*jr* will have to wait until late spring for most of the software packages to be released. At HesWare, Stevens says, there just aren't enough *jrs* to go around. "We have five programmers working on one machine." ■

Unix *(continued)*

ing," guesses Robert Fertig, head of Enterprise Information Systems, on the name for this new Unix operating system.

● It's the "Nina," "Pinta," and "Santa Maria" operating systems which will link the old PC-DOS operating systems to the new world of Unix and ultimately to IBM's big VM mainframes, says Kenneth G. Bosomworth, head of International Resource Development (IRD).

"IBM doesn't want Microsoft or Digital Research, Inc. to control their destiny, and he who controls the operating system does that," said Fertig in Greenwich, Connecticut. Microsoft developed the operating system for the PC—PC-DOS.

"IBM has got to do something," says Fertig about the considerably improved technology competition IBM now faces in the 16-bit PC market. Tandy Corp. and Texas Instruments' professional computers are good examples. He believes the 32-bit Unix machine—sometimes dubbed "Popcorn"—will be at least one of IBM's coming offerings.

At IRD, in Norwalk, Connecticut, Bosomworth sees that IBM, with the move to Unix, is trying to quickly fend off AT&T (developers of Unix), which is expected to introduce a top-notch Unix-based personal computer this year. IBM's move would also counter AT&T's attempt to supply the *de facto* standard operating systems for the next PCs. IBM is expected to keep open architecture on the PC, PC*jr* and PC/XT. ■

The Xante Production Station (XPS) lets stores generate programs on diskettes and cartridges.

Xante: Software While-U-Wait

New distribution system makes programs and manuals on the spot for PC and PC*jr*.

BY JAMES LANGDELL

NEW YORK—Xante Corp. is offering a new way to distribute software. The Xante Production Station (XPS), which will be installed this month, will allow stores—even supermarkets —to create any of thousands of software packages on the spot. Programs can be loaded onto diskettes and cartridges for a wide range of game machines and computers, including IBM's PC and PC*jr*. The XPS will also print labels and a manual up to 10 pages long and record the transaction.

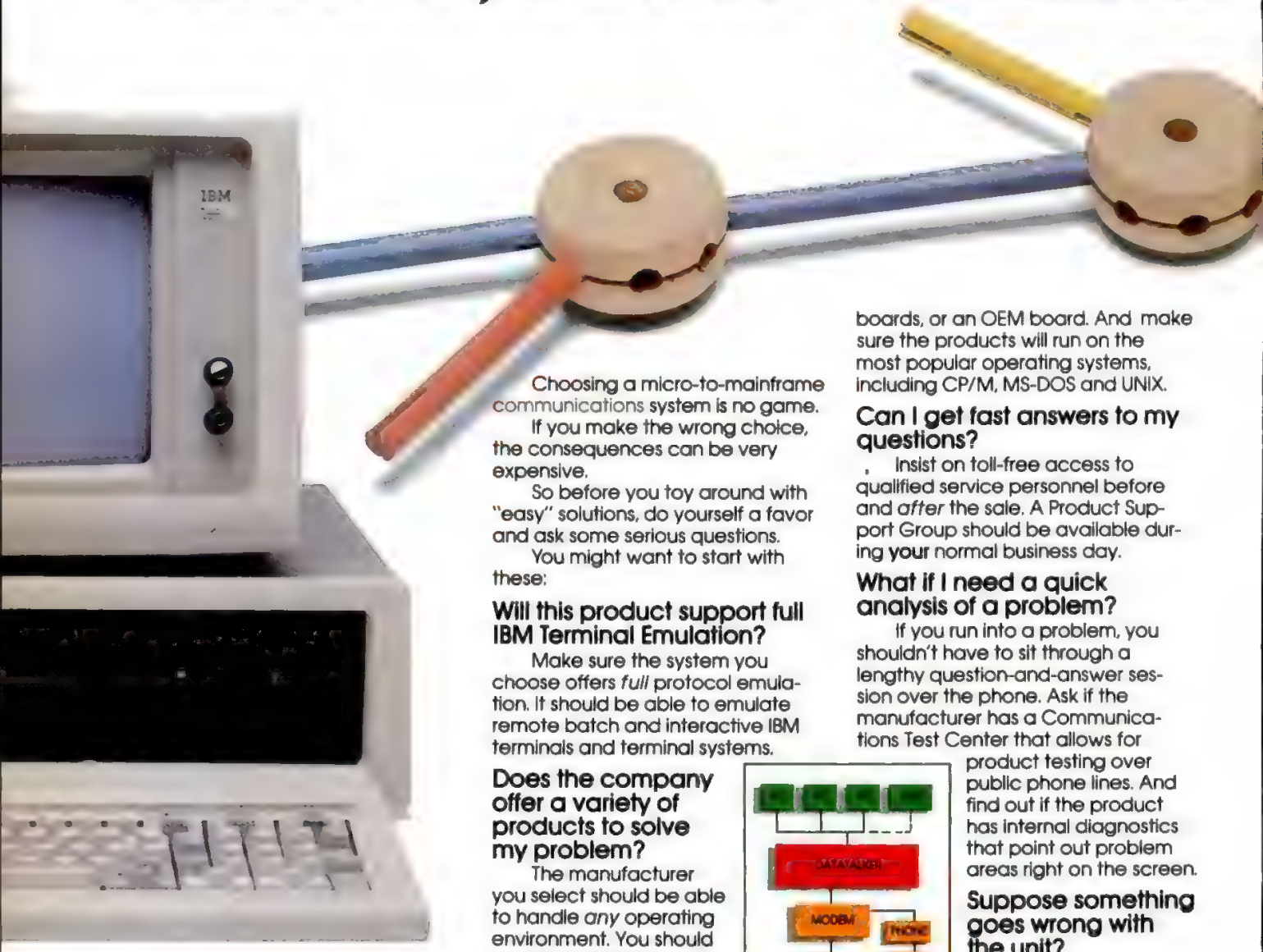
The XPS units in stores are linked through telephone lines to mainframe computers at Xante's Tulsa, Oklahoma headquarters or at Xante's regional network nodes. When a customer requests a software package, a clerk at the store loads the Xante station with a blank diskette or a one-shot EPROM cartridge.

For most programs, the memory in the store's unit provides about 90 percent of

(continued)

Micro-to-mainframe:

Before you settle for solution, ask a few serious



Choosing a micro-to-mainframe communications system is no game.

If you make the wrong choice, the consequences can be very expensive.

So before you toy around with "easy" solutions, do yourself a favor and ask some serious questions.

You might want to start with these:

Will this product support full IBM Terminal Emulation?

Make sure the system you choose offers *full* protocol emulation. It should be able to emulate remote batch and interactive IBM terminals and terminal systems.

Does the company offer a variety of products to solve my problem?

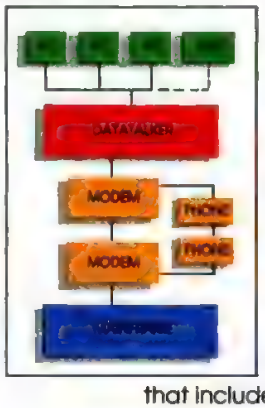
The manufacturer you select should be able to handle *any* operating environment. You should have your choice of stand-alone front-end processors, IBM PC or XT boards, or an OEM board. And make sure the products will run on the most popular operating systems, including CP/M, MS-DOS and UNIX.

Can I get fast answers to my questions?

Insist on toll-free access to qualified service personnel before and *after* the sale. A Product Support Group should be available during your normal business day.

What if I need a quick analysis of a problem?

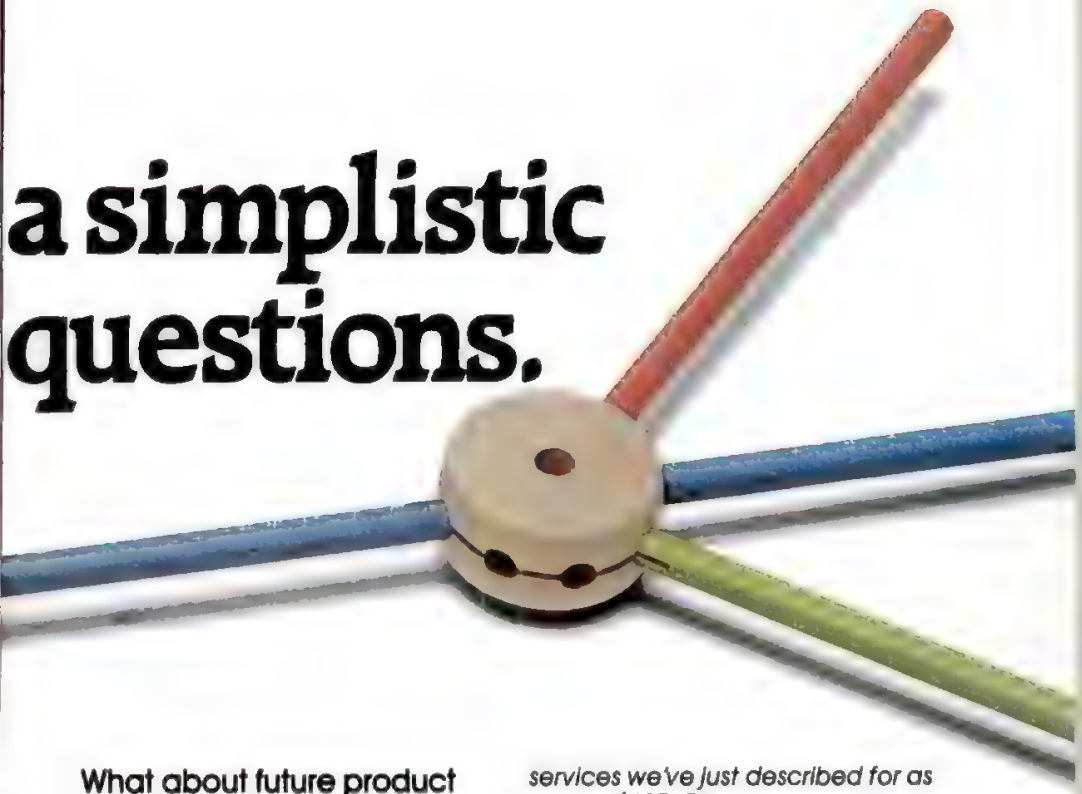
If you run into a problem, you shouldn't have to sit through a lengthy question-and-answer session over the phone. Ask if the manufacturer has a Communications Test Center that allows for product testing over public phone lines. And find out if the product has internal diagnostics that point out problem areas right on the screen.



Suppose something goes wrong with the unit?

Be sure the company offers a service plan that includes a 30 day money-back guarantee and a 12 month warranty that includes a free replacement unit.

a simplistic questions.



What about future product development?

It's not enough for a company to solve your communications problems today. Ask about their commitment to R&D. Are they working on products you're going to need soon? If not, you might want to consider someone who is.

Who am I dealing with anyway?

In a market as volatile as this one, you need some reassurance that the people you buy from will be around to back up their products. Ask how long they've been in business. The longer, the better.

How much is all this going to cost?

There are lots of micro-to-mainframe solutions with lots of price tags. But here's a point of reference for you:

Our own DataTalker™ product line will give you all the capabilities and services we've just described for as little as $695. Complete.

Granted, this isn't all the information you'll need to choose the right micro-to-mainframe solution. But it's a good start.

If you'd like to know more—and there certainly is more to tell—contact our Marketing Support Group

Providing Data Communications Solutions

We'll make sure you get the answers you need. And we won't play games.

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DataTalker™

By Winterhalter, Incorporated

Winterhalter, Incorporated has been providing data communications solutions to major manufacturers of microcomputers and word processors since 1978. Our DataTalker front-end processors and PC boards are used by companies around the world, from start-up manufacturers to the Fortune 1000.

NASDAQ SYMBOL WNTL

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Writing and Organizing Business and Personal Letters Has Never Been So Easy.

A Powerful and Flexible Total Correspondence Package

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- Global Search of Letter Files.
- Copy one letter, all letters, or a group of letters to a new location.
- Delete one letter, all letters, or a group of letters.

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SPELL CHECKING:
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- Automatic justification after correction.
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- Recall one specific letter, all letters, or a related group of letters.

NAMING AND FILING:
- 1 to 25 character Letter Name
- User-designated Letter I.D. Phrase (40 character "key" phrase from letter).

IN GENERAL:
- Designed specifically for 1 to 6 page business and personal letters.
- Smooth and fast single keystroke operation.
- An abundance of user-defined options, settings, formats, and functions.
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FRIENDLYWRITER™ with FRIENDLYSPELLER™

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TWO DISKETTE PACKAGE, REQUIRES PC-DOS (1.0, 1.1, 2.0), 64K MEMORY with DOS 1.0 and 1.1, OR 96K MEMORY with DOS 2.0, ONE DISK DRIVE, ANY 80 WIDE MONITOR, ANY IBM-COMPATIBLE PRINTER.

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"FriendlySoft products are available at leading hardware and software dealers worldwide"

[illegible] READER SERVICE CARD

Xante *(continued)*

the code that's loaded onto the blank media; the other 10 percent is transmitted from a central Xante location. The code is divided in this way to prevent the retailers' Xante stations from being used to make unauthorized copies of programs. And, by providing only a small portion of each program from Xante's central locations, telecommunications costs are reduced, and software pirates have nothing to gain by tapping into Xante's transmissions, the company declared at the recent announcement.

The Xante station can be changed to create cartridges and diskettes in different formats simply by plugging in different disk drive or cartridge modules. Roger Collins, founder of Xante, said a module that creates PC*jr* cartridges has been designed, but that Xante is waiting until it has IBM's full technical description of the cartridges.

Xante has arranged with software publishers to distribute over 250 programs through its system. Programs published by Perfect Software, Epyx, Sierra On-Line, and Imagic were among the products distributed by Xante in its tests this winter, where Xante Production Stations were operated at retail locations in the southwest.

How It Works

The software offered through Xante includes productivity products as well as games. For programs that require manuals longer than the 10-page booklets, which are printed on the spot by the store's XPS, the retailer can keep a stock of published manuals, to be sold only when software is purchased.

Xante's central system records every transaction. The original publisher is paid its share by Xante. The retailer is paid directly by the customer. Xante bills the retailer for the standard fee a more transitional distributor would collect. The retailer can obtain full records of its transactions from Xante.

Collins said that Xante will be functioning strictly as a software distributor. The company does not plan to open its own retail outlets to sell software through its machines. Xante will be providing retailers with special racks with display cards advertising up to 900 programs, but no systems that demonstrate software. "Retailers found that kids would hang around and monopolize the demo stations," Collins explained. "They seemed to scare away other customers."

Xante also intends to keep out of the business of software publishing. Some software publishers, however, are allowing Xante to distribute titles that were not previously released. These publishers originally found it too risky to market these programs through traditional channels, but decided that the Xante system was a more economical way to bring software directly to customers. Programs need never go out of print, even in versions for less-popular computers. Collins added that the Xante system will enable software publishers to "bring new products to market as much as several months earlier."

For information, contact Xante Corporation, 6846 South Canton, Tulsa, OK 74136, (918) 492-4089. ■

Jack 2 Plays Off Its Competition

Harvard B-School helps in contest to evaluate integrated business software

BY CONNIE WINKLER

KINGS PARK, NY—So who needs integrated software? What's it good for, anyway?

Business Solutions, Inc. plans to get to the bottom of that question with a contest pitting its new *Jack 2* integrated package (word processing, graphics, spreadsheet, database) against all comers. Beginning this month, face-offs with the IBM PC package will be held in seven U.S. cities to determine which applications are really suitable for integrated packages and which packages are most effective.

The immediate problem, however, is that there are few comers.

"Most of our competition isn't available, yet," says Alan Dziejma, who heads Business Solutions. Dziejma's second problem is lining up participants from local business graduate schools and audiences for the seven face-offs. The first will be in New York, followed by San Francisco and Los Angeles. (Those interested in attending the competitions should contact Business Solutions Inc., 60 E. Main St., Kings Park, N.Y. 11754 (516) 269-1120.)

Both the Harvard University Business School and the accounting firm of Touche Ross and Company will be involved in the contest, which is envisioned to focus on the technology, not the hype currently surrounding integrated packages. Dziejma counted more than 30 such packages at the recent COMDEX. "One of the statements implicit in this contest is the high degree of confidence we have in our technology," the president adds about *Jack 2*, which is available for the IBM and Apple II and III.

Harvard, in one of its classic case studies, is developing a set of applications that could benefit from integrated software—the problem for the contest.

Touche Ross will evaluate each product's performance. Evaluation criteria will have little to do with time and more to do with how much can be accomplished in several hours.

The products expected to compete in the first test include *1-2-3*, *WordStar*, and *Desq* from Quarterdeck. The necessary hardware configurations will be made available, and the graduate students who will run the tests will have opportunity to practice, Dziejma said.

Jack 2, which was shipped in January, requires 128K RAM and retails for $495 for the IBM PC.

Infoscope ... Its magic happens right before your eyes

Thirty minutes with your new computer and Infoscope, and you can be showing off — entering information, sorting it, displaying it, putting it to work in ways you never dreamed possible.

Infoscope, a revolutionary new program for dynamic information management, opens up the potential of the personal computer. It's usable and useful now, even for a beginner, but it'll never get in the way in the long run.

From the first minute you use it, you'll discover some very interesting applications. It comes with demonstration "scripts" and sample data so you can sit back and watch it do its stuff without doing a lot of tedious data entry.

Infoscope helps you create "Scopes" to display data — windows on the screen that grow, shrink, move around, and overlap, while showing you just the information you want to see.

As you work with it, Infoscope adapts to your level of expertise. Its "choice-driven" approach makes it easy for a new user to get up to speed, but it doesn't entangle an expert in a maze of menus he doesn't want to see.

In short, Infoscope is as simple or as complex as you want it to be, and it does virtually any information management chore you want it to do.

But you have to see it for yourself. Infoscope is available for most popular 16 bit microcomputer systems. Ask for a demonstration at your local computer store, or write us for details.

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CIRCLE 326 ON READER SERVICE CARD

Lampoon Does IBM Double Take, Turns Little Tramp to Great Dictator

Leave it to the *National Lampoon* to turn IBM's lovable Charlie Chaplin ad campaign into a scene from "Springtime for Hitler," the stage parody depicted in the movie *The Producers*. An ad mimicking IBM was part of a *National Lampoon* January issue that looked much the same as *Time* magazine, but sounded a lot different.

According to Glenn Eichler, *Lampoon*'s managing editor and the copywriter for the fake IBM ad, the staff wanted to run an ad for a computer company and picked IBM because it is "the most visible and recognizable and identifiable." Another important reason, Eichler said, is because "IBM has taken the Chaplin character and beaten it to death. When a company saturates every medium available with its advertising—to the point where it gets obnoxious—it's time to give them a taste of their own medicine," he stated, rather succinctly.

Ironically, Eichler got most of the facts he used in his ad from *Time*'s 1983 cover story on IBM, "Big Is Bountiful." Along with another staffer's idea that IBM's Chaplin figure could be replaced with "der Fuehrer," *Time*'s facts could be used to support Eichler's already caustic opinions of Big Blue. Although he doesn't own a computer, Eichler said he has watched "the development of the PC and its subsequent throttling of the marketplace. IBM's way of doing business reminds me of the robber barons of the nineteenth century." The "little tramp" became the "great dictator."

Eichler doesn't restrict his barbs to IBM, at least in conversation. "If I were to do a TV ad right now, I might consider going after Apple," he said, referring to Apple commercials that suggest that anyone with a computer can have a relaxed, flexible work schedule and a healthy, happy life. Eichler doesn't like "these new-wave, skinny workers who are so at peace with themselves that they play basketball instead of drinking at lunch."

Eichler insisted, however, that he is "not a vicious guy." No matter how acerbic they are, he said in his own defense, the *National Lampoon* parodies "show that the advertising people have done their jobs well."

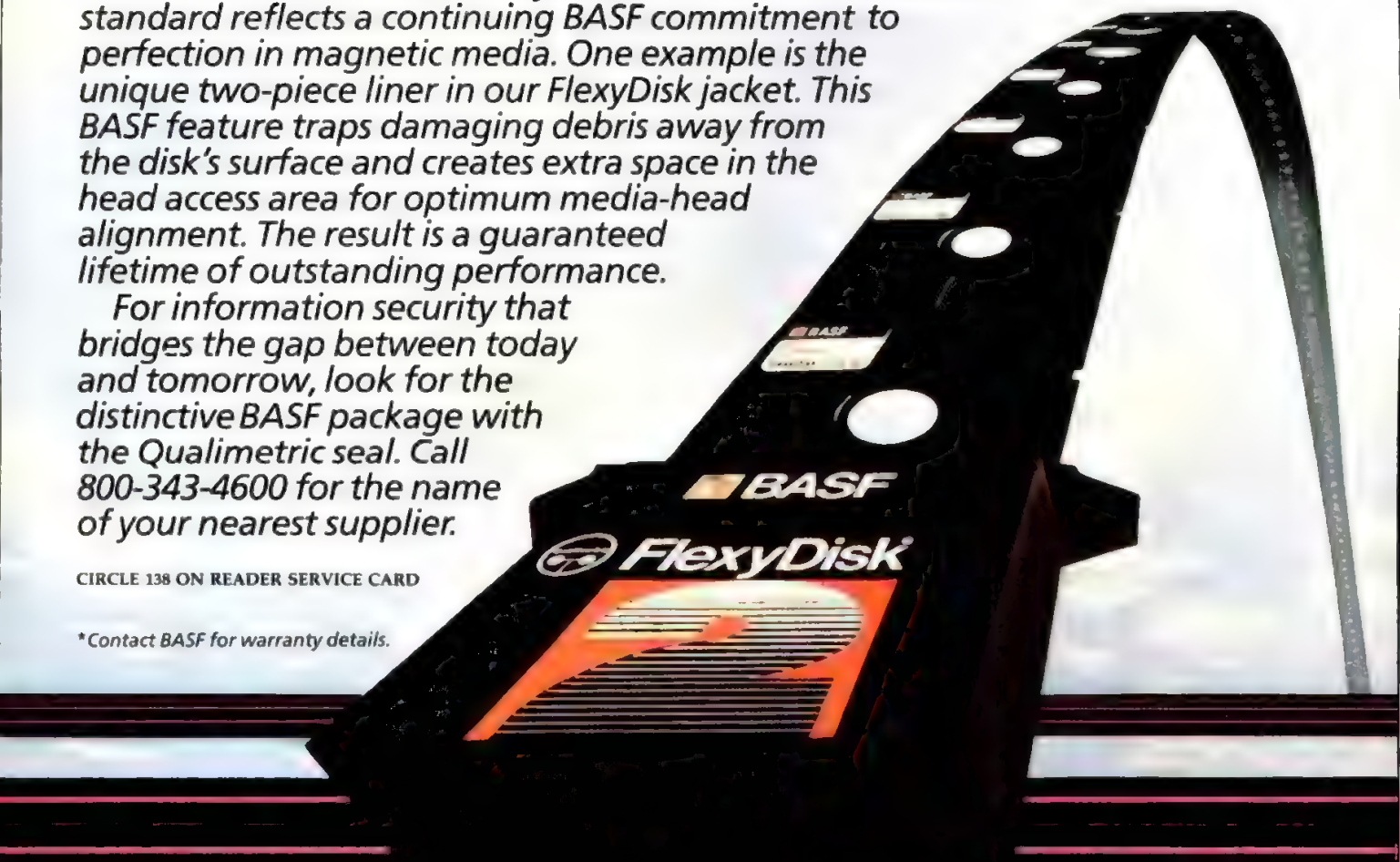
—Karen Cook

BASF QUALIMETRIC™ FLEXYDISKS.* A GUARANTEED LIFETIME OF OUTSTANDING PERFORMANCE.

BASF Qualimetric FlexyDisks feature a unique lifetime warranty,* firm assurance that the vital information you enter on BASF FlexyDisks today will be secure and unchanged tomorrow. Key to this extraordinary warranted performance is the BASF Qualimetric standard... a totally new set of criteria against which all other magnetic media will be judged.

You can count on BASF FlexyDisks because the Qualimetric standard reflects a continuing BASF commitment to perfection in magnetic media. One example is the unique two-piece liner in our FlexyDisk jacket. This BASF feature traps damaging debris away from the disk's surface and creates extra space in the head access area for optimum media-head alignment. The result is a guaranteed lifetime of outstanding performance.

For information security that bridges the gap between today and tomorrow, look for the distinctive BASF package with the Qualimetric seal. Call 800-343-4600 for the name of your nearest supplier.



CIRCLE 138 ON READER SERVICE CARD

**Contact BASF for warranty details.*

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Graphics on a letter quality printer?

You bet!

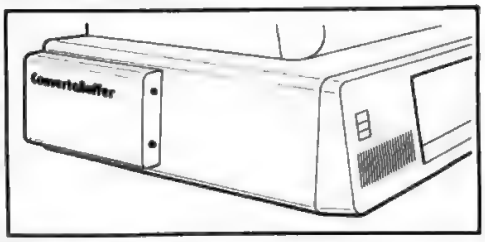
graphics

ConvertaBuffer™

IT'S A CONVERTER. There was a time when buying a letter quality printer meant giving up graphics. Now, however, ConvertaBuffer™ gives you the best of both worlds by allowing you to print the business graphs generated by programs such as MBA and 1-2-3 on letter quality printers such as Diablo and NEC. And, the quality of these graphs are as good as those drawn by dot matrix printers such as the IBM/Epson. ConvertaBuffer translates the Epson-format graphics data output from MBA, 1-2-3, and other packages with graphics capability into the format necessary for printing on a letter quality printer.

IT'S A BUFFER. Generating graphics requires the outputting of a large amount of data to the printer. ConvertaBuffer speeds this process by receiving the data as fast as your PC can send it — 1,000 characters per second; storing up to 64K bytes of data in its built-in memory buffer; and then sending it to the printer at the printer's slower speed — 25 to 55 characters per second. This allows you to go on to other work without having to wait for the printer to finish printing.

EASY TO INSTALL. ConvertaBuffer comes with its own built-in cables which plug directly into your PC's printer adaptor and your printer's cable without removing the cover of the system unit — there is no need to buy an extra cable. And, each unit has its own fully regulated DC power supply — the unit does not steal power from the PC or the printer.



ConvertaBuffer also features a convenient front panel switch which resets the buffer to abort the printer output if desired. And, the status light indicates when ConvertaBuffer automatically switches to the graphics mode.

HAVE YOUR CAKE AND EAT IT TOO! The parallel-to-parallel ConvertaBuffer for graphics is the latest member of the ConvertaBuffer family. The original ConvertaBuffer enables you to connect any RS-232C serial interface equipped printer directly into the parallel printer port of your PC with up to 32K bytes of printer buffering.

Ask your dealer about ConvertaBuffer for graphics and the original ConvertaBuffer. Or contact us.

von Leivendyke
ENTERPRISES

Silvermine Avenue Norwalk, Connecticut 06850 203-846-4973

Please send me further information on ( ) graphics ( ) original ConvertaBuffer.

I have a _____ printer, with ( ) parallel ( ) serial interface.

Name _____ Phone ( ) _____

Street Address _____

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CIRCLE 109 ON READER SERVICE CARD

Brady turns "What now?"

Your IBM PC* has arrived. You've opened the boxes, read the instructions, and plugged in the cords. Now you have a keyboard and a monitor. You have a 16 bit microprocessor chip, a floppy disk drive, DOS, tracks, bytes, and sectors, and RAM. You might have a color display, a printer, a ribbon cartridge, a color graphics card, and pixels by the score. You might have a joystick, a modem card and boxes of manuals. It speaks a foreign language—probably BASIC. You have it. Now what do you do with it?

It's the same situation as having your new car delivered in parts. It isn't much use to you unless you can sit down, start it up, and go somewhere.

The Brady Co. has the answer to WHAT NOW?—no matter what you need! Brady has everything to make the machinery perform as promised and beyond your expectations with books, games, and software. Better yet, there's much, much more to come! The list of titles is growing as rapidly as the industry and as quickly as your curiosity.

Whether you use your IBM PC* or PC*jr** for business, home management, education, or pleasure, Brady is the company to turn to when you don't know where to turn. So when you are baffled by your PC, Brady has the answers to turn "What Now?" into an excited "What's Next?"

IBM PC&XT OWNER'S MANUAL: A PRACTICAL GUIDE TO OPERATIONS

by Barbara Lee Chertok, Dov Rosenfeld, James Stone

For the beginner who wants to learn how to use the IBM PC as quickly and easily as possible, this clear, concise tutorial is indispensable. The manual is practical enough to include examples to get the user up and running on the IBM PC in a minimum amount of time. This new guide to operations turns a novice into a skilled user without any attempt at programming instruction.

1983/128pp/paper/ISBN 0-89303-531-9/D5319-1/$12.95

ADVANCED BASIC AND BEYOND FOR THE IBM PC

By Larry Joel Goldstein

A complete guide to the advanced skills of BASIC programming, it includes complete coverage of files, graphics, event trapping, machine language, and subroutines. This self-study book offers a second course on BASIC programming for the IBM PC. It includes many ready-to-use programs and exercise sets complete with questions and answers. It's a must for the IBM PC programmer.

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WORDSTAR FOR THE IBM PC

Now, the incredible Wordstar can be mastered with this step-by-step journey through its many features. From learning the fundamentals to managing more complicated commands, this book explains it all in an easily understood style that won't lose the

into "What next?"

beginner or bore the more advanced user.
1984/ISBN 0-89303-956-1/$17.95

THE GRAPHICS GENERATOR: BUSINESS AND TECHNICAL APPLICATIONS FOR THE IBM PERSONAL COMPUTER, VERSION 1.06

by Larry Joel Goldstein

This is the first IBM software graphics for business to access both Visicalc™ and Supercalc™. It transforms spreadsheets into full-color graphics using the IBM PC. This specialty software will give you the power to more easily visualize and analyze important data. Since you can use it with a variety of printers and plotters, this is an ideal way to organize your information into a visually pleasing and understandable form.
1983/2 diskettes with documentation
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Diversion Games Division

A fast-paced skill and action game where reflexes and common sense are tested every second of play. Darius IV offers all the challenges of an arcade space game. The player must avoid air mine fields, cannons, and deadly "air snakes" while locating one of 15 possible landing sites on the planet of Darius IV. Treasure is the goal and escape is the final achievement until all 15 areas are conquered.
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In your Lasercycle, you suddenly surge forward into the center of the first arena. Walls of destructive energy confine you to the racing circuit. A deadly attack sphere blazes toward your cycle. To survive, you must destroy it quickly, before it destroys you!

Lasercycle requires rapid acceleration and extraordinary steering in racing from arena to arena. You must conserve your energy reserves and absorb Power Pods when you can. Your acceleration boosters lightning speed and your cunning maneuvers will save you for the next race to survive.
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CIRCLE 156 ON READER SERVICE CARD

SPINWRITER INTR

Now you have a choice of fully compatible Spinwriters for your IBM PC and XT.

NEC MODELS OFFER SPEEDS OF 200 AND 350 WORDS PER MINUTE.

First, a few words about the original, the Spinwriter 3550.

It was the first and only totally compatible letter-quality printer for the IBM PC. It plugs directly into the IBM PC and works with every piece of IBM PC software, as well as all popular third-party application packages, such as WORDSTAR,™ WORDPLUS,™ VOLKSWRITER,™ VISIWORD,™ MULTIMATE,™ BPS GRAPHICS,™ LOTUS™ 1-2-3,™ and VISICALC.™ It even looks like it was made for the IBM. Now, as good as the Spinwriter 3550 is, we recognize that a single printer can't take care of every business or professional office need. So we've added another IBM PC compatible Spinwriter: The 2050.

The new 2050 has a printing speed of 200 words per minute. And while it costs less, the print quality is still impeccable. So if low-volume letter-quality printing is what you need, the 2050 is your answer.

60 different print thimbles let your IBM PC look its best.

One of the things that gives our Spinwriter capabilities you can't even get on other printers is our unique "thimble." Each thimble holds up to 128 characters. You can even have two different type faces on one thimble or print multiple languages from a single thimble. Think of how handy

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SPINWRITER OFFERS OVER 60 DIFFERENT TYPE FACES.

thimbles last for over 30 million impressions.

So it won't end up costing you a fortune to look like a million.

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One reason for Spinwriters' staying power is the fact that we manufacture every major component. It also helps explain why NEC Information Systems is the number one supplier of letter-quality printers to PC users in America. Of course, someday you may need a little service. If you do, it's nearby. We have a large group of NEC-trained professionals all around the country. It's also quick. Because of our modular design, normal repairs take less than 20 minutes.

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9 DIFFERENT NEC-BUILT FORMS HANDLERS AUTOMATICALLY FEED ANY OFFICE FORM YOU HAVE.

You'll find Spinwriters at participating ComputerLand stores, Sears Business Systems Centers, IBM Product Centers nationwide, Entré Computer Centers and authorized NEC Spinwriter distributors. Or call 800-343-4418 for more information. And find out why more and more IBM PC users are saying, "NEC and me."

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CIRCLE 342 ON READER SERVICE CARD

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Visi On...and On ...and On...and

PC News takes a first look at VisiCorp's touted Visi On integrated software

BY JAMES LANGDELL

NEW YORK — VisiCorp's long-awaited Visi On system is closer to being ready, but there's still more to be done before its commercial release. One milestone has been reached, at least: *PC Magazine* was finally supplied with a copy of the program in its unfinished state. While any of our comments on this unreleased product are tentative until VisiCorp starts selling the complete system, we believe our initial impressions are helpful.

The San Jose, California, developer provided us with the *Visi On Applications Manager*, the Visi On Mouse, *Visi On Calc*, and *Visi On Plot*. *Visi On Word* wasn't available, and the system lacked the Scripts function that would allow users to store series of Visi On commands in the equivalent of an AUTOEXEC file.

Installing Visi On on an IBM XT was quite easy and straightforward. There are a lot of files that make up the Visi On software, so it took about an hour to install the system on the hard disk and to connect the mouse. The instructions were clear and thorough and the disks were well labeled.

Visi On was hungrier for memory than we expected. VisiCorp announced that the much-touted environment could be used with a minimum of 256K of RAM. On a system with that amount of memory, however, the hard disk was accessed for overlay files with frustrating frequency, causing annoying waits. It took 512K of system memory before Visi On would operate with enough fluency to be practical.

Visi On
VisiCorp
2895 Zanker Rd.
San Jose, CA 95134
(408) 946-9000
List Price: Visi On Mouse $250, *Visi On Applications Manager* $495, *Visi On Calc* $395, *Visi On Graph* $250

Open the Windows

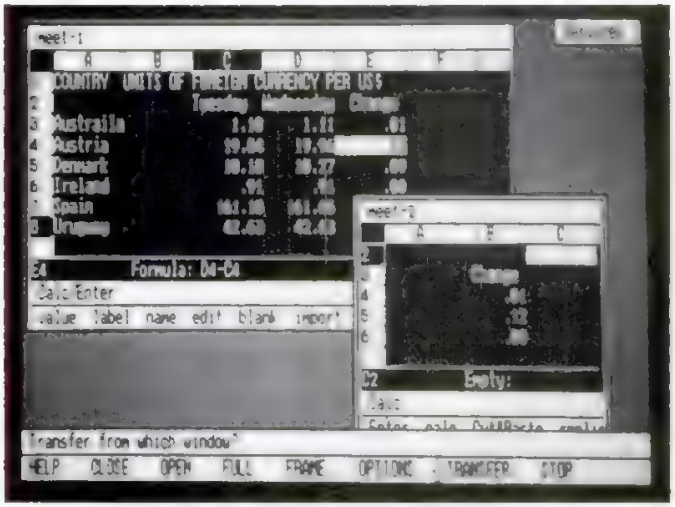
What about the windows? They turned out to be rather confusing. After setting up a screen with a number of overlapping windows, it was easy to lose track of which windows were open. If a window completely covers up another open window on the screen, there's no way to access the covered window —or even know it's there— without redrawing or closing the window that keeps it out of view.

Redrawing a window is a rather cumbersome process. It's not as easy as moving a sheet of paper across a desk—or even folding a newspaper on a crowded subway. Each time you change a window's size or position, you have to move the cursor to the command line to select the Redraw option, move the cursor to indicate the window you want (you have to do this even when a single window fills the entire screen), and then indicate the upper left-hand corner and the lower right-hand corner for the new window. You don't see whether you opened the window enough until Visi On redraws the screen—and each time this happens you spend a lot of time staring at the hourglass cursor, which means "Please wait."

The file system, reached by selecting Archives from the main menu line, is rather confusing. The relations between items on the Archives screen—folders, worksheets, and wastebaskets—aren't very clear. The Archives system will assign default names to the files, which may lead to confusion if you use the generic default names repeatedly. The windows themselves aren't labeled in a way that clearly identifies their positions in the file hierarchy.

Whenever I performed operations that switched from one window to another, I was concerned that I should be doing something to save files (or folders, or worksheets, or whatever) as I went along. I noticed no prompts asking if I wanted to save files, nor did I see instructions on the screen telling me how to go about saving.

I wondered whether Visi On might be saving everything automatically. As an experiment, I turned off the XT's power switch while in the middle of a *Visi On Calc* spreadsheet. When I turned the power back on again, it didn't take long to get Visi On started up again—it took less time, in fact, than the XT needed to recount its 512K of chips. However I found no trace of the files I'd just created.



Visi On's help facility was a disappointment. VisiCorp dubbed this feature "hypertext"—a context-sensitive help system in which you could point to the part of a screen you didn't understand and appropriate help messages would appear. Most of the times I requested help, however, the introductory

(Continued)

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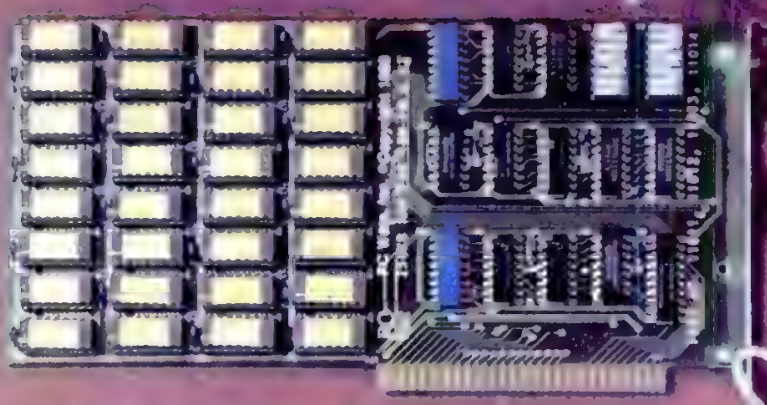

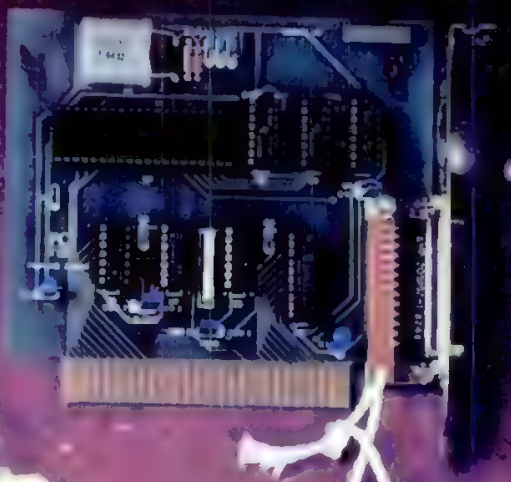

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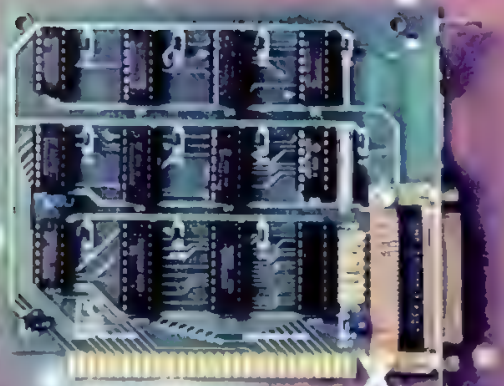

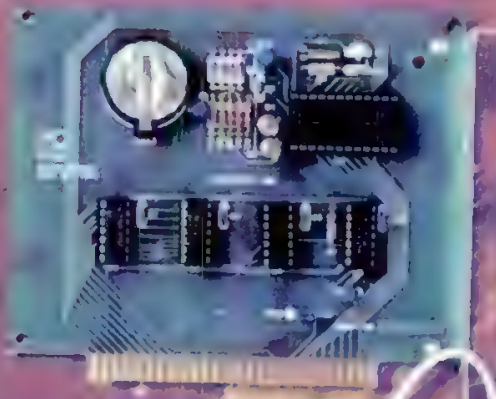

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Visi On *(continued)*

screen for the help menu would appear, inviting me to scroll the help topic list across a small help window until I saw the topic I wanted.

Several times I had to go through several levels of menus and explanations until I could reach something that related to the situation that, meanwhile, could be plainly seen in the window that surrounded the help window.

Send in the Mice

What about the mouse? Visi On was designed so that many things can be done by pointing with the mouse. Unfortunately, there are many operations that can only be done with the mouse, and not from the keyboard. Since the system doesn't buffer signals from the mouse, you have to wait until you're prompted for the next step in a process, even if you're experienced enough with Visi On to know what comes next.

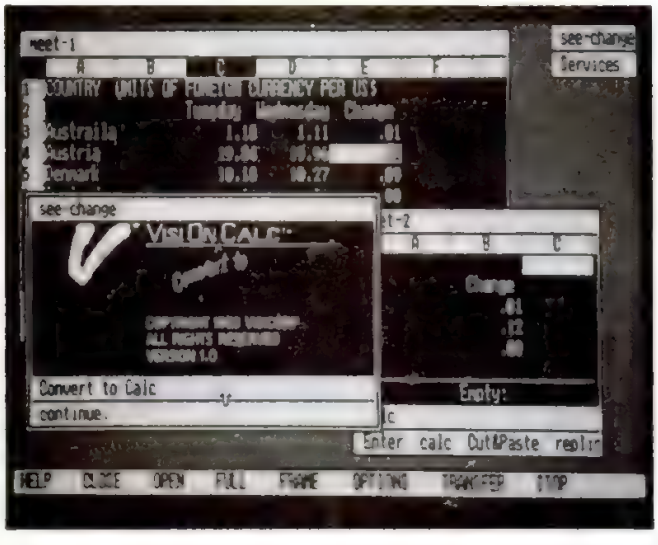
For scrolling, you have to hold down the right button while moving the mouse on the optical pad, an action that tired my hand. It was hard to scroll with enough finesse to position the desired section of a large spreadsheet in a small window. Most areas in a window could be scrolled if the window was too small to show everything. Some lines of explanations and options, however, could not be scrolled, so there was no way to read or use these items while the window was too small. There was no automatic way to have one of these windows rescale itself to the necessary size—you have to experiment until you get it large enough.

Visi On Calc turns out to be a great improvement over *VisiCalc*. The spreadsheets can be much larger and operations are easier to do and understand. This applications program in itself, however, is not an advance over other software that's now available.

Visi On did make it easy to convert data from a *Visi On Calc* spreadsheet in one window into a graph in a *Visi On Graph* window. Since this operation was a featured part of Visi On demonstrations over the past year, VisiCorp must have had a lot of opportunities to get the bugs out of this part of the program. I found that I'd have to have part of each window needed in the operation visible on the screen before I started the process. If any window was out of reach, I'd have to start over.

Each Visi On applications program will probably work best when it runs in a window that fills the entire screen. Perhaps the best way to approach the Visi On environment is as a package of integrated programs—use them one at a time and get involved with the windows as rarely as possible. For some transferring operations, the windows will shine, but most of the time they provide more confusion than benefits.

Visi On proves to have at least one attractive quality. When you're doing window operations, it looks like you're doing something really important. A worker could simply set up a few windows and switch back and forth between them all day and look like he was churning out stacks of work. If nothing else, VisiCorp has created a very convincing "productivity simulation" system. ■



IBM's New Display Format for Fine Art

We've seen the IBM Gallery of Science and Art's first art exhibits, and we can say that this museum is as fine a space for paintings and sculptures as it was for the hardware and software in its inaugural exhibits (see "Inside The IBM Museum," *PC*, Volume 3 Number 1).

Now the gallery is presenting two exhibitions. The larger, titled "Paris, Rome, Athens: Travels by French Architects in the 19th Century," displays paintings and drawings of archaeological sites. The exhibit includes some works that accurately record the appearance of the ruins and others that present the French artists' fanciful reconstructions of ancient buildings and the life that surrounded them when they were new.

The smaller exhibit is of "Lensless Photography"—artworks produced directly onto black-and-white and color film without the use of a camera. The works in this exhibit come from the Franklin Institute in Philadelphia.

These two exhibitions will be on display in IBM's Manhattan office at Madison Avenue and 56th Street until March 24, 1983. The gallery is open 11 a.m. to 6 p.m. Tuesday through Friday and from 10 a.m. to 5 p.m. on Saturdays. Admission is free. Appointments can be made to see IBM's permanent exhibit of antique calculators by calling (212) 407-6212.

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No MS-DOS Tartan For Macintosh

Apple woos independent peripherals, software developers for spiffy $2,500 machine

CUPERTINO, CA—With the launch of its $2,495 Macintosh system, Apple Computer has put to rest any notions that it intends to market products that are compatible with the IBM PC. It is clear that the Macintosh, which looks and acts very much like a mini-version of the Lisa, will not run PC-DOS or any other flavor of Microsoft's MS-DOS operating system.

Instead, Apple has designed a machine that complements its much bigger Lisa office system. The Lisa comes with 1 megabyte of main memory, a 5-megabyte hard disk drive and about 2.5 megabytes of operating system code, while the Macintosh is a much more compact machine.

Formally unveiled at Apple's annual meeting in late January, the Mac, like the Lisa, is based on the 32-bit Motorola 68000 microprocessor. It comes with 128K of main memory, 64K ROM (which contains major portions of the Macintosh operating system), a built-in Sony 3.5-inch microfloppy drive (which holds up to 400K), and a 9-inch diagonal black-and-white display. The keyboard and a mouse are included in the price. The whole system is quite portable, weighing under 20 pounds including the keyboard.

Despite early rumors to the contrary, the Macintosh does provide a very similar user interface to that found on the Lisa: The attached mouse is used to select and manipulate "desktop" objects, in the form of icons, that appear on the machine's high-resolution display. For example, to delete a file, a Mac user would place the icon of a file over the icon of a trashcan that is always displayed on the screen.

Although the Mac's 68000 chip is set to operate at about 8 Mhz, the machine does not support multitasking like the Lisa. You can display multiple windows on the screen simultaneously, but they cannot be produced by different applications programs.

The only point on which Apple seems to have taken note of the IBM world is in communications. Business users will be able to buy add-on hardware called Appleline that will enable the Macintosh or the Lisa to emulate IBM 3270-type terminals and to tap into IBM's local area network when that arrives.

Almost 100 independent software companies, including Microsoft and Software Publishing Corporation, are working on products for the Macintosh—revising current products or developing totally new packages. Apple itself has produced a number of programs for the Mac, including *MacPaint* (a clever graphics package that uses the Mac's high-resolution screen to the fullest), and *MacWrite* (a simple word processing program for documents 8 to 10 pages in length). ■

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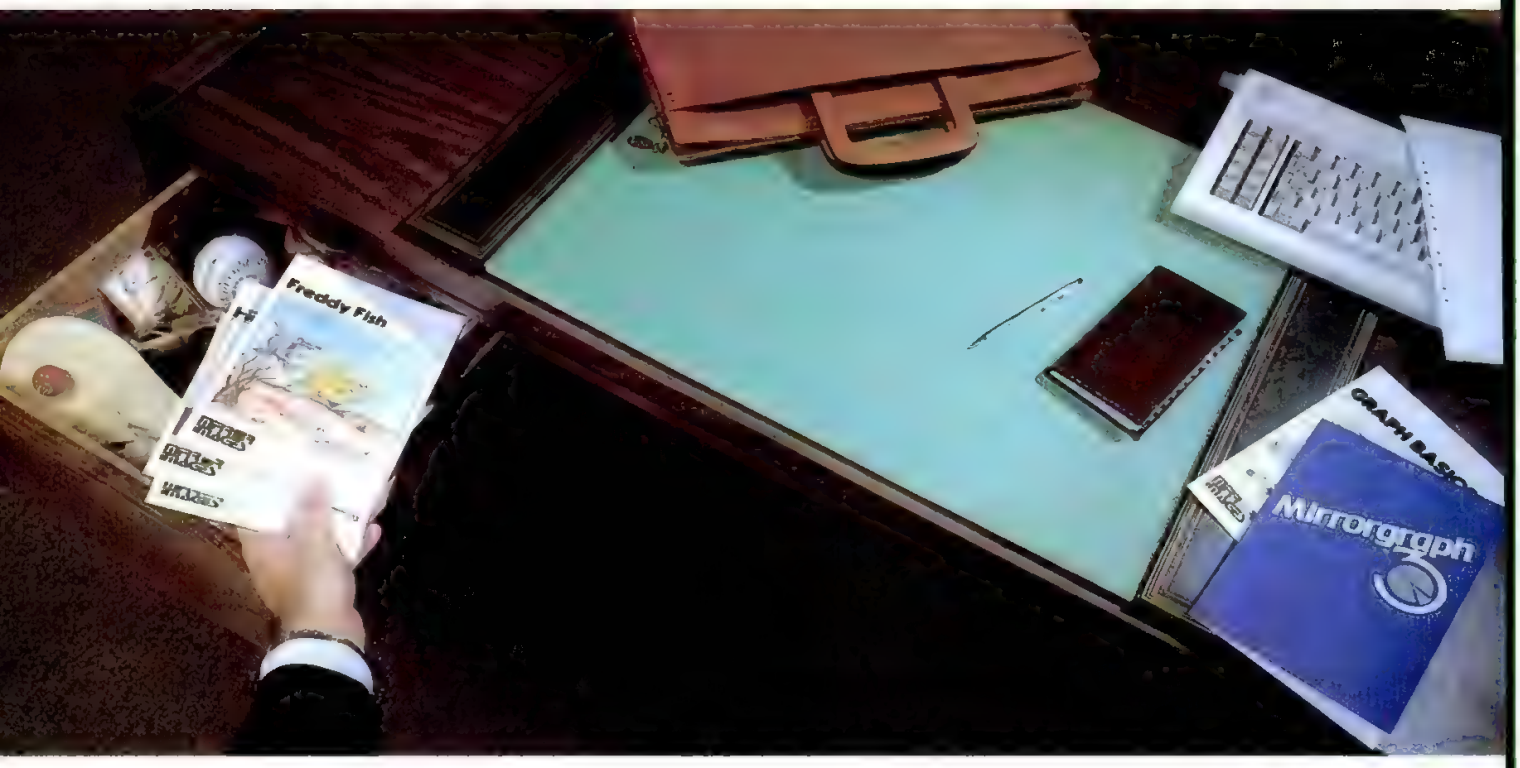

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PRODUCT REVIEW

MultiMate Word Processor Slows Down in New Version 3.20

BY IAN GARVEY

MultiMate, version 3.20
SoftWord Systems, Inc.
52 Oakland Avenue North
East Hartford, CT. 06108
(800) 842-8676

(dealer support hotline);
(800) 243-4646

(customer support hotline);
(203) 522-2116 (in Connecticut).
List Price: $495
Requires: 256K RAM (suggested).

Users of the just-released *MultiMate*, version 3.20 word processing update have noticed slower speed on the most commonly performed functions.

Functions such as saving a page of text, moving and copying text from one page to another, making a page break, and accessing a printer to accept a document take anywhere from 2 to 5 seconds longer than they did with version 3.11, which 3.20 is replacing. (An earlier version was reviewed in *PC*, Volume 1 Number 10.)

Cause of Slowdown

The worst slowdown occurs while repaginating a document. For example, version 3.20 took almost 2 minutes to repaginate a 10-page document from 40 lines to 42, while version 3.11 performed the identical task in less than 30 seconds.

What causes the slowdown? During each of the functions, 3.20 performs five separate program steps. It opens up the document, saves the page, saves the page counter, saves the link record (which helps DOS locate the data), and then closes the document. The 3.11 version performed only one function, writing out the document to disk.

"*MultiMate* is now lightning proof," said Tom McGuire, senior programmer and analyst at SoftWord Systems, Inc., the program's manufacturer, alluding to the possibility of a power failure. "You can lose text only under really unusual circumstances."

Will Jones, president of SoftWord Systems, one of the six creators of *MultiMate*, described the slower speed as a response to users' requests to safeguard text. He said slowing the functions down was the trade-off for more safety.

Jones also said he was a little anxious about the slower functions but is confident that users will adjust to it. According to Matt Page, who manages SoftWord's Technical Support Division, there have been very few complaints about slower performance since the company began distributing the update in December 1983.

However, some users have complained about a hitch that comes when repaginating documents that contain a variety of page format lines. *MultiMate* has a formatting function that makes it possible to insert a different format line anywhere on a page of text.

Repaginating Problems

For example, if a user begins a document by selecting a double-spacing format, he can insert single spacing into a page at any point. If the document is repaginated later, a user would expect the inserted single-spacing format to carry over. This does not occur with 3.20. Users can end up with pages of text filled with helter-skelter format lines. To correct the problem, the user has to manually move from page to page.

"The problem with repagination formatting simply slipped by us," explained McGuire. "But there is a way to fix it. A new function on the 3.20 can replace any format line. Users can use a discretionary search and replace operation to make the job easier. Our new update will correct the problem."

Toll-free Help

Jones said eligibility for updates is being extended so that all *MultiMate* users will receive the next update, which is expected to be issued around June 1984.

SoftWord has also increased its technical support services. Four new toll-free lines were added on January 5, 1984. Users who have trouble with repagination or experience other problems can call the toll free line at (800) 243-4646 for help.

Other new features in *MultiMate* 3.20 include a spelling checker developed by Proximity Devices, Inc. of Ft. Lauderdale, Florida. It uses an 80,000 word dictionary created by Merriam Webster. The spelling checker is accessed directly from the main menu. There is also a key features option that enables users to create a file containing any number of keystrokes that can be stored and recalled at any time.

Other refinements to *MultiMate*, which were suggested by users, permit defaults to be changed during the process of creating a new document. Among the choices are setting the number of lines per page, deciding whether to allow widows and orphans, and requesting automatic page breaks. The printer summary screen has also been expanded; new prompts for bin and sheet feeder controls are among the enhancements.

Thanks to *MultiMate*, SoftWord's growth has been anything but slow. A scant year ago in January 1983, some of the company's 14

(continued)

MultiMate *(continued)*
employees missed a paycheck when revenues barely reached $20,000 that month. But two months later, sales rose dramatically to $500,000 a month after favorable reviews of *MultiMate* appeared in major computer magazines.

January 1984 billings were about $2 million and total sales for 1983 (SoftWord's calendar year ends in March 1984) are projected at between $15 to $18 million. Will Jones is confidently predicting sales of over $40 million in 1984.

Converts From Wang

A check of the company's customer hot line reveals that at least some of SoftWord's astounding growth derives from users of the Wang word processor. Wang users are evidently converting over from dedicated word processing to the IBM PC because of the PC's ability to perform as a full computer. They are selecting *MultiMate* as their word processing software, because *MultiMate* is patterned after Wang, and operators need little training to make the transition.

Wang users have been calling SoftWord to find out if there is a way to convert documents written on Wang's 8-inch disks directly onto the PC's 5-1/4-inch disks. There is a way, and SoftWord is currently testing software that will make the procedure simple.

The product hasn't come full circle, however. The company reports it's *not* developing a *MultiMate* version for the Wang PC. When we asked, the spokeswoman laughed. ■

Portable PC's Peak Performance

Seattle climbers challenge Mt. Everest with Columbia portable computer

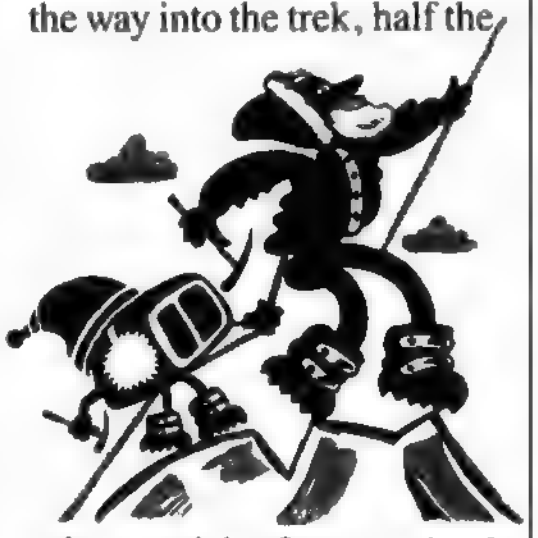
BY CONNIE WINKLER

SEATTLE—Portable computing is going to new heights—the highest. Members of the Ultima Thule climbing expedition, organized here, left in February for the peak of Mt. Everest, with a portable Columbia computer on their backs. Actually, the IBM-compatible is on the back of a yak. Twenty-one of these pack animals will truck 16 climbers, mountain enthusiasts, and medical professionals to the summit of Mt. Everest. Their route will take them up the China side of the highest and most difficult-to-scale mountain.

"Moving 7 tons of equipment between 7 different camps on 21 yaks is no easy logistics problem, but one that obviously required a personal computer," thought one of the climbers, W. R. "Bob" Berg. Berg, in Seattle, is president of Zepher Industries, a distributor for Columbia Data Products.

Columbia donated a portable machine (number 25,000 off the assembly line) and much moral support to the approximately $600,000 trip, which is funded by about 17 companies, involved primarily in high-tech and medical fields.

"The yaks carry different loads at different altitudes, and their efficiency, naturally, drops as the altitude increases," Berg said, in an effort to explain the need for the computer. Also, the climbers must consider what would happen if, one-third of the way into the trek, half the



yaks get sick after a rash of bad weather. The Columbia will prescribe "what if" answers for such situations, as well as monitor the expedition's supplies.

The programming for this logistics program was done by a computer science instructor at the University of Washington in Seattle.

High-Minded Crew

Although this is the first time a computer has scaled Mt. Everest, it's not the first time this crew has climbed. "We had such a good time climbing Mt. McKinley for the Bicentennial in 1976, we kept looking for another project," said Berg. Ultimately, the 12 climbers teamed up with several doctors, including a neurosurgeon studying the link between brain disorders and lack of oxygen. His thesis, which will be tested on the trip up, is that the lack of oxygen first affects the central nervous system and brain. That dysfunction triggers other reactions in the body.

For definitive testing, the climbers are toting a laboratory equipped with a brainwave monitor normally reserved for operating rooms; a blood-measuring device; a lung monitor; and an oscilloscope to assure everything's working. The Columbia will only store data; it will not be directly involved in the testing process.

This atypical backpacking equipment will be set up in a special weather fort—"almost a house"—designed for high altitudes, explained Berg. Generators burning aviation fuel will power the equipment...and the space heaters.

How successful the expedition turns out to be depends on what Berg termed "change factors"—the biggest one being the weather. If their luck holds, the climbers expect to reach the 29,028-foot peak in May.

"It's a terrific chance," said the 40-year-old Berg about the Ultima Thule expedition, which was painstakingly arranged with the help of a Chinese mountaineering association.

Ultima Thule seems like the right name for the expedition. It originated with the Greek mapmakers who used to label the farthest places known in the world as "Ultima Thule." Despite taking a giant step for portable computers, the Columbia's journey will climax early. The portable will only get as high as 21,000 feet—the site of the last camp. ■

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pfs: Family Grows Into Communications

Software Publishing Corp. adds $95 pfs: Access program to its package

MOUNTAIN VIEW, CA —Software Publishing Corp. keeps expanding its product line. The most recent addition is *pfs: Access*, a communications package with a one-button log-on to public databases and electronic mail networks. In April, the company is expected to announce another program "in the $100 range" for electronic mail communications.

pfs: Access ($95 for the IBM PC and $70 for Apple II) was unveiled at the Softcon show in late February and will go to dealers in April, said product manager Susan A. Gersh.

Because the program can "learn" a sequence of numbers, it's possible to program in the numbers and codes so as to quickly access databases and electronic mail services such as MCI Mail or Western Union's Easylink. For business users hesitant to send private messages through public networks, the data is encrypted using the DES standard, said John D. Page, vice president of engineering at Software Publishing.

The program can be used to access home banking services, a feature that Gersh and Page feel will be a major selling point.

The package works with most serial interface cards, and supports most 300 and 1200 baud modems. ■

CALENDAR OF EVENTS

DATE	EVENT	COMMENT	LOCATION	CONTACT
March 12-15	Interface '84	A 54-session conference on desktop computers and the AT&T divestiture.	Las Vegas Convention Center Las Vegas, NV	The Interface Group 300 First Ave. Needham, MA 02194 (800) 325-3330 (617) 449-6600
March 13-16	Inside the IBM PC	Technical seminars for advanced users, programmers, designers, and engineers.	Sheraton-Hartford Hotel Hartford, CT	Northeastern University 360 Huntington Ave. Boston, MA 02115 (617) 329-8000
March 16-18	Phoenix Computer Showcase Expo	For business users of small computers and word processors.	Phoenix Civic Center Phoenix, AZ	The Interface Group 300 First Ave. Needham, MA 02194 (800) 325-3330 (617) 449-6600
March 22-23	North Central Region Association for Computing Machinery Regional Conference	Strategies for integrating micros and mainframes.	Midland Hotel Chicago, IL	North Central ACM '84 P.O. Box 2381 Chicago, IL 60690
March 22-25	West Coast Computer Faire	Hardware, software, and speeches by industry executives.	Civic Auditorium and Brooks Hall San Francisco, CA	Computer Faire, Inc. 181 Wells Ave. Newton, MA 02159 (617) 965-8350 (415) 364-4294
April 5-7	COMDEX/Winter	Hardware and software for computer dealers.	Los Angeles Convention Center Los Angeles, CA	The Interface Group 300 First Ave. Needham, MA 02194 (800) 325-3330 (617) 449-6600
April 17-19	Federal DP Expo	Hardware and software aimed at MIS managers. Emphasis on integrating desktop computers to mainframes.	Washington Convention Center Washington, DC	See above

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People in the News: Greg Slyngstad

Systems operators on CompuServe's PC SIG have the answers.

BY KAREN COOK

Microsoft cares. That's the message that comes across when Greg Slyngstad, Microsoft's special projects coordinator, dials into the IBM PC Special Interest Group (SIG) on CompuServe.

For an hour or so a day, Slyngstad scours the PC SIG's message board, looking for questions from users with problems related to Microsoft's products. "Sometimes it's easier to find me on CompuServe than to get through to me on the phone," he says.

Slyngstad knows Microsoft's products inside out. His full-time job is beta-testing Microsoft offerings, including the recently released *Word* program. Slyngstad also has years of programming experience with other computer companies, so he can answer almost any question that comes along.

"The range of questions on the PC SIG goes from beginning level to very advanced," he says. "And there's somebody out there with an answer for 99 percent of the questions asked."

The Wailing Wall

Wes Meier, system operator for the PC SIG, is glad to have Slyngstad on line. "Greg knows a heck of a lot," Meier says. "People use him as a sounding board and a wailing wall, but he manages not to get too defensive about Microsoft." Angry complaints from users are "a problem," Slyngstad acknowledges. "There are some users on the SIG with big egos who think they know a lot, to put it nicely."

One issue that gets PC users really worked up is

Microsoft's software-protection policy. Many of the PC SIG members, including Meier, are vehemently opposed to the use of protective codes that restrict the number of backup copies users can make. The PC SIG lists code breakers for *VisiCalc*, *1-2-3*, *Multiplan*, and Microsoft *Word*, among other popular programs.

"Everyone here at Microsoft is well aware that they are listing the code breakers," Slyngstad says. "We thought about trying to stop the SIG from putting *Word*'s code on the database, but we decided not to. That group is only a couple of thousand users. We would be a lot more upset if *PC Magazine* decided to list the code."

Such code breakers are not listed on Microsoft's own SIG, which has about 700 active members. Clay Jackson, system operator for the Microsoft SIG, answers questions about CP/M, Applesoft cards, and Microsoft products for other computers besides the PC. Occasionally, Slyngstad sits in for Jackson. "We give first priority to our own SIG," Slyngstad says. "No one would notice if I stopped visiting the CompuServe PC SIG."

Marketing Feedback

But Slyngstad has no plans to abandon his career as Microsoft's electronic ombudsman on the PC SIG. "It's fun," he says. Not only is the PC SIG a great resource for PC users, but it provides useful information to Microsoft as well. "Sometimes I print out user comments and pass them around the office," Slyngstad explains. "Or I listen to see what products SIG members are raving about and then try to get them. It's good feedback for our marketing department."

CompuServe's IBM PC SIG is its third largest, behind user groups for Atari and TRS-80 computers. And the PC SIG is still growing. At year's end, 5,303 people had dialed in via modem and signed up as members. Of those, Wes Meier estimates that 1,500 to 2,000 call the SIG at least once a week.

Visitors to the PC SIG can leave messages on the bulletin board for other PC owners who use the service, or they can join the electronic conferences Meier schedules at 8 p.m. (EST) on Sundays. The 1,500 active users and their combined expertise are "a tremendous resource for the beginning PC user. If you ask a question about APL, for example, you'll get 14 good answers from people with hands-on experience," Meier reports.

The PC SIG's database has several thousand entries, including help files for using CompuServe, free word processors and other programs, and patches allowing users to copy popular programs.

Birth of a SIG

The SIG was founded in February, 1983 by Mike Todd, a lieutenant commander in the Navy and also chairman of the Washington, D.C., Capital PC User Group, one of the largest in the country. "Before our IBM SIG got started, the only forum for IBM was the *Computers & Electronics* magazine SIG, which had about 10 active members in the segment devoted to IBM," Meier recalls.

Within months, the CompuServe SIG was doing such a booming business that Todd found he couldn't devote his full time to it. Meier, who had been a SIG "sysop," or system operator, from the start, assumed many of Todd's chores. ■

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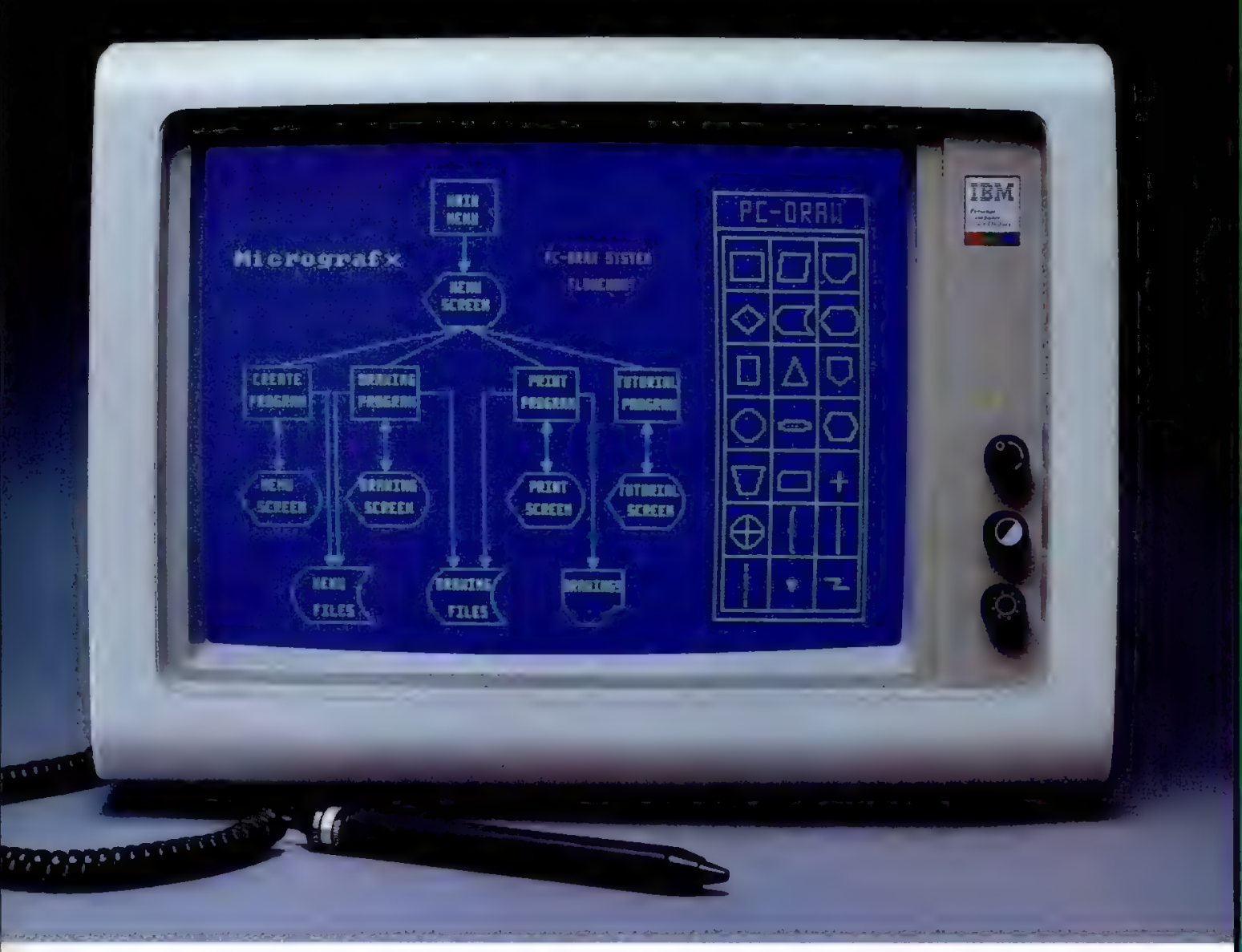

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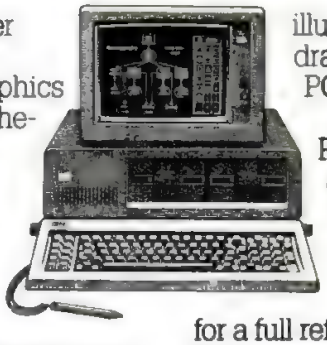

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Is MS-DOS Turning Japanese?

Japanese computer and electronics manufacturers seem to have fixed on the PC's own operating system as a ticket into the U.S. micro market.

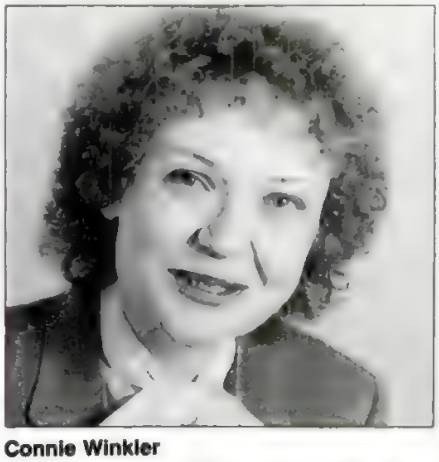
Whether it's color TVs or carnival trinkets, mass production is the Japanese forte. Now the IBM PC and its ubiquitous operating system, MS-DOS, have given the Japanese the wedge they needed to get into the U.S. personal computer industry: standardization. The rallying 'round MS-DOS by both vendors and users *here* signals "Let 'em roll" to the production lines in Japan.

That the Japanese electronics and computer manufacturers have hit on MS-DOS as the safe standard on which to build a product was clearly demonstrated at the recent COMDEX trade show, where dealers and retailers got a sneak peek at what will soon be on their shelves. The plethora of applications programs for the IBM PC and MS-DOS is not going to disappear, and the Japanese astutely figure they will run just as well on Japanese-made personal computers.

When Japanese computer makers have introduced products here in the past, they have not been assured of that snug nest of users . . . users always on the lookout for a better buy, as who among us isn't?

Closing in at COMDEX

At COMDEX in Las Vegas, it turned out that the booths of the Japanese companies plotted almost a circle in the middle of the giant exhibition hall. For starters, there was Fujitsu. And Matsushita. And



Connie Winkler

Mitsubishi, Sanyo, Panasonic. (Curiously, the level of attentiveness to visitors to the booth varied from arms-out welcomes, usually from American employees, to total indifference from the Japanese employees.)

The Panasonic PC offering, a $3,000 self-contained portable dubbed Senior Partner and expected in the spring, is perhaps the most representative of the Japanese strategy. Senior Partner is an all-in-one: printer, double disk drives, 9-inch screen, and an estimated $1,500 of popular U.S. software packages such as *WordStar* and *VisiCalc*.

For the PC bargain shopper who may have eyed the Eagle or even the IBM PC in the past, the price and no-decisions-necessary Panasonic system seems to be a deal. Indeed, each of the Japanese products has "that little something extra" that's not readily (or cheaply) available on U.S.-made machines.

How successful the Japanese will ultimately be at selling personal computers is, to say the least, an interesting question and one that is going to haunt the industry for the next several years. Even the Wall Street financial analysts who follow the Japan and/or the micorcomputer companies can't agree. Nor will history necessarily be instructive.

In both the semiconductor and mainframe computer arenas, the Japanese have been neither as successful as some pessimists predicted nor as bumbling as others hoped. In both these industries circumstances have developed, often unforeseen, that have affected the Japanese penetration. (And, of course, we're still waiting for the last word.)

In these industries, the Japanese manufacturers—who number among the elite of Japanese companies—are hampered by lack of sales and distribution channels in the U.S. In fact, distribution and sales remain big hurdles for the Japanese in peddling personal computers. On the mainframe side, the Japanese resorted to teaming up with American manufacturers, Amdahl Corp. and Fujitsu, for example, to introduce their systems in the U.S.

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their own worst enemies. Their culture imposes some inherent and most fascinating limitations, the main one being that the Japanese culture treasures conformity.

A Literary View

PC Magazine contributing editor Jared Taylor knowledgeably presents this dilemma in his absorbing new book, *Shadows of the Rising Sun: A Critical View of the 'Japanese Miracle,'* (William Morrow and Co.).

"Americans were the first to make 16K computer memory chips, but Japanese companies took the lead in 64K chips and could easily be the first to mass-market a 256K chip. This is the kind of race in which they excel, for it is one in which the goal is clear. It takes no conceptual breakthrough to realize that 256K chips have four times the capacity of 64K chips. Constant incremental improvement and superb production technology will win the day."

However, what works with hardware doesn't necessarily work with software development, as Taylor also notes:

"The best programs are written by talented individuals, not by production teams. This, explains one American programming consultant who has worked with the Japanese, is why the United States still has a substantial lead in the field. 'But it may not last,' he adds. 'The Japanese are spending millions of dollars trying to find the hidden patterns in all good programming. They are trying to reduce it from an art to a process. And once they do, they'll be the best.' "

The Japanese intend to use that full-force, brute-strength approach to develop new software, including a highly sophisticated mainframe operating system, something many software geniuses judge as the most difficult of man's creations. In 1981, in a joint business-government effort of the type that's standard in their country, the Japanese launched a much-publicized campaign to build the world's most powerful supercomputer. It would be called the fifth generation and use the principles of artificial intelligence, the Japanese proclaimed.

Today it's wait-and-see how successful they'll actually be at a task that challenges the most superb of the U.S. supercomputer architects and manufacturers.

Japanese clumsiness with software development has prompted at least one other

The Japanese are spending millions of dollars trying to find the hidden patterns in all good programming.

marriage of interest. Microsoft has developed what it calls the MSX standard operating system for a consortium of Japanese manufacturers. One software industry analyst here calls it only a "games" standard and says "not to worry."

The MSX system is becoming almost as controversial as the MX missile—and for many of the same economic and political reasons. Although 14 Japanese companies endorsed MSX, 3 have already produced MSX machines, and several others have commercial products in the works, Japan's MITI is now reportedly suggesting these companies withdraw from the agreement—or just not do anything. MITI (Ministry of International Trade and Industry) is the extraordinarily powerful, government-backed agency that is the matchmaker between the banks and the Japanese industrial giants . . . and in that role has rallied and lead the Japanese semiconductor and computer industries.

A Love Match?

More importantly, what Microsoft has done—by plan or by default—is gather the Japanese manufacturers around MS-DOS. Some industry watchers attribute that match to Kazuhiko Nishi, sometimes described as "Japan's only true entrepreneur." Controversial Nishi, whom friends here call "Kay," tailed Microsoft chief Bill Gates, and finally met him at a trade show. That meeting stretched to 9 hours, and the friendship continues.

While the Japanese match is great for Microsoft's dowry, one has to ask how IBM feels now that its partner for the PC operating system has taken a new lover. The issue must be especially sore since IBM as a corporation has long argued that to fight off Japanese intruders IBM must be regarded as a "natural resource" that the U.S. needs to care for, cultivate, and coddle.

Such a protectionist cry vaguely echoes the automobile industry, which has assuredly been badly hurt by the Japanese. If U.S. automakers had been less comfortable and protected by the U.S. government, would they have warded off the Japanese inroads to the American car market? If U.S. auto companies had designed and delivered high-quality, practical transportation, would Detroit still be jumpin'?

Which gets us (somewhat circuitously) back to the Japanese personal computer and the unanswered questions: How will U.S. micro makers respond? Will U.S. manufacturers cry "foul" or will they whip up better, cheaper products? How will users respond—will they follow their wallets, as economic theory suggests?

Will the Japanese out-IBM IBM? Typically, IBM sits back and waits for the dust to settle on any new technology before introducing a product. The PC is a prime example. Now the Japanese are trying the same maneuver, although they're playing cat and mouse with software, which is more malleable than hardware.

All the interest and investment in MS-DOS indicates that it's going to be around for a while. PC users—no matter how IBM soups up its next machine or wiggles the operating system—are not about to give up the money and time they have invested in MS-DOS applications. If the Japanese do not have the winning hand, they certainly are betting on the right cards. ■

Plain Talk About Printers...

Dot Matrix

Printer compatability with the IBM-PC marches on: in addition to the Okidata Microline Series with Plug-N-Play, the C. Itoh Prowriter now comes in a new version (the BPI) that's compatible with the IBM-PC (see below). So what's keeping the rest of the manufacturers?

ANADEX

B Series

Anadex printers are fast, powerful & American made. The **9500B & 9501B** (120cps) have 10, 12 & 17 cpi, double width, dot graphics (60 x 72 dpi); the **9501B** has enhanced print modes.

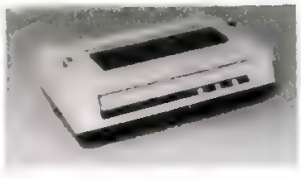
The **9620B & 9625B** (200cps) have 10, 12 & 17 cpi, double width, dot graphics (72 x 72 dpi); the **9625B** has a proportional font.

The **WP-6000** (275 cps) offers 10, 12 & 17 cpi, correspondence & proportional fonts, typefaces (Helvetica, Serifa, etc.), 154 x 144 dpi graphics. All **B Series** printers listed have 136 columns, friction/tractor feed & a parallel interface.

9500B	$1119.88
9501B	$1119.88
9620B	$1199.88
9625B	$1299.88
WP-6000	$2349.88

C. ITOH

Prowriter
Prowriter BPI



C. Itoh's **Prowriter** (120 cps) features 10, 12, & 16 cpi, a proportional/correspondance quality font, double strike, double-width, sub/super scripts, dot graphics (160 x 144 dpi) & friction/tractor feed.

The **Prowriter BPI** offers code-compatability with IBM-PC block/dot graphics codes, & it has all the features of the Prowriter. A nice move.

Prowriter BPI	$459.88
Prowriter	$399.88

IDS/DATAPRODUCTS

P-480

The **P-480** (formerly MicroPrism) is a nice general-purpose printer w/120 cps bi-directional printing, 10, 12 & 17 cpi, a correspondence font, 84x84 dpi graphics, & friction/tractor feed. A nice product.

P-480	$429.88

MEMOTECH

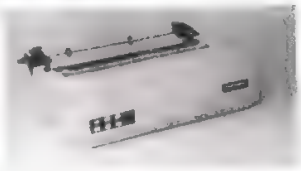
DMX-80

A dramatic black printer! The **DMX-80** (80 cps) features 10, 12 & 16 cpi, italics, double-width, half-width, enhanced/bold print, dot graphics (120 x 144 dpi), friction/tractor feed. Comes with a 4,000,000 character ribbon. Epson code compatible in text mode (questionable in graphics). Quiet printing & a sharp design make it ideal for home or office. The **DMX-80** is serviced by Panasonic.

DMX-80	$389.88

MANNESMANN TALLY

MT-160 L/180 L
MT-Spirit



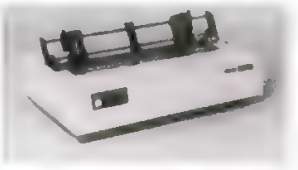
The **MT-160 L** (160 cps) features 10, 12, 17 & 20 cpi, a correspondence font, italics, enhanced/boldface print, double-width, sub/super scripts & underline, friction/tractor feed. Parallel & RS-232C interfaces standard. The **MT-180 L** is the 136 column version.

The **Spirit** (80 cps), Tally's new, low cost draft printer, has 10, 12 & 17 cpi, italics, friction/tractor feed, & a unique square-wire printhead. 80 columns & parallel only.

MT-160 L	$649.88
MT-180 L	$849.88
MT-Spirit	$329.88

OKIDATA

Microline Series



The **Microline 92** (160 cps) is ideal for word processing. It features 10, 12 & 17 cpi, a correspondance font, double-width, emphasis/boldface, sub/super scripts, underlining, pin/friction feed (tractor is optional on the **92**) & dot-addressable graphics (120 x 144 dpi). The **93** is the 136 column version. Parallel interfaces are standard; the RS-232C interface is optional.

The **Microline 84** (132 col) is the Step 2 version, featuring 200 cps at 10, 12, & 17 cpi (w/double-width), all with a correspondance mode & dot addressable graphics. Parallel or RS-232C interfaces available.

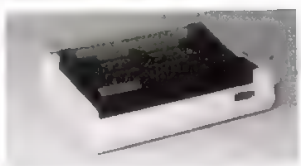
A new PROM called **PC Plug-n-Play** turns a **92, 93** or an **84** into an IBM-PC compatible printer, with full capabilities. You will sacrafice a few features (like 12 cpi) but the PROMs are worth it if total compatibility is your goal.

The **Microline 82A** (120 cps) is a data crunchers. Features 10 & 16 cpi (5/8 double-width). Dot-addressable graphics are optional. The **83A** is the 136 column version.

Microline Series	$CALL

STAR MICRONICS

Gemini 10X/15X
Delta 10/15
Radix 10/15



The **Gemini 10X** (120 cps) features 10, 12 & 17 cpi, italics, double-width, emphasis & boldface, sub/super scripts, underlining, graphics (120 x 144 dpi), a 1K buffer & friction/tractor feed. The **Gemini 15X** is the 132 column version.

The **Delta 10** (160 cps) features both parallel & RS-232C interfaces, & an 8K buffer, plus all the 10X features mentioned above. The **Delta 15** is a 136 column version.

The **Radix 10** (200 cps) features both parallel & RS-232C interfaces, a 16K buffer, plus all the 10X features mentioned above. The **Radix 15** is a 136 column version.

Gemini 10X	$299.88
Gemini 15X	$419.88
Delta 10	$529.88
Delta 15	$669.88
Radix 10	$719.88
Radix 15	$839.88

Other Dot Matrix Printers We Carry

EPSON

RX/FX Series	$CALL

IDS/DATAPRODUCTS

Prism 132	$1239.88
w/4-color	$1669.88

INFORUNNER

Riteman	$349.88

TOSHIBA

P-1350	$1759.88

Letter Quality

C. ITOH

A10 Starwriter
F10 Starwriter
F10 Printmaster

The C. Itoh **Starwriter** (40 cps) features 10 & 12 cpi, sub/super scripts, underlining, 6 & 8 lpi, Qume code & Diablo supplies. The **A-10 Starwriter** has the same specs, but it's slower (20 cps). The **Printmaster** has the same specs, but it prints faster (55 cps).

Both the **Tractor Feed** & the **Sheet Feeder** fit all three models.

A-10 Starwriter	$609.88
F-10 Starwriter	$1219.88
F-10 Printmaster	$1569.88
Tractor Feed	$289.88
Single Bin Sheet Feeder (A10/F10)	$619.88

NEC

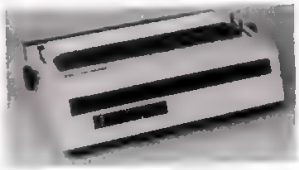
Spinwriters

The new **2000** Series are slower (20 cps), but they've retained all the qaulity of the 3500/7700 Series. Uses the same thimbles & ribbons.

2010/2030	$879.88
2050	$999.88
3530	$1639.88
3550	$1899.88
2000/3500 Tractor	$239.88
2000/3500 Sheet Feed	$CALL
7710/7730	$2159.88
7700 Tractor	$379.88
7700 Sheet Feed	$CALL

SILVER REED

EXP-550/500



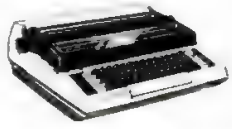
The Silver Reed **EXP-550** (17 cps) is a 132 column letter-quality printer with 10, 12 or 15 pitch, sub/superscript, underlining & ***true*** Diablo 1610 emulation, making it compatible with most word processing software. It's friction fed, & it features a page injector; an optional tractor is also available.

The **EXP-500** (12 cps) is a 100 column letter-quality printer with the same specs as the **EXP-550**, but slower & without page inject or proportional spacing.

EXP-550 (Parallel)	$669.88
EXP-550 Tractor	$139.88
EXP-500 (Parallel)	$439.88
EXP-500 Tractor	$129.88

SMITH-CORONA

Messenger



The **Memory Correct III Messenger** (the full name) is ideal for the home or small office. It combines the features of an electric typewriter ***and*** a letter-quality printer. It features 12 cps, 3 pitches (10, 12 & 15), variable line spacing, 10.5" writing line, backspacing & auto-correction. It comes complete with parallel/serial interface.

Memory Correct III Messenger	$609.88

STAR MICRONICS

PowerType

The **PowerType** (17 cps) has 110 columns (11" print line), 10, 12 & 15 cpi, proportional type, sub/superscripting, backspace/underlining & Diablo 620/630 code compatability. A nice printer for the price.

PowerType	$399.88

Other Letter Quality Printers We Carry

COMREX

CR-2	$509.88
CR-2 Tractor	$94.88
CR-2 Keyboard	$149.88

DIABLO

620 (RS-232C)	$999.88
630 (PC)	$1979.88

DTC

DTC 380Z	$CALL
StyleWriter	$CALL

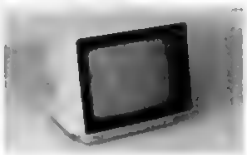
QUME

Sprint 11/Plus	$1539.88

Monitors

NEC

JB-1205M-A
JB-1201M-G



Slick design & slick specifications. The NEC **JB-1205M** is the amber version. The **JB-1201M** is the green screen. Both offer 80 columns on a 12" diagonal screen, with an 18-20Mhz bandwidth & a crisp, clear display.
JB-1205M (12" amber)..... **$179.88**
JB-1201M (12" green)..... **$169.88**

AMDEK

300G (12" green)..... **$149.88**
300A (12" amber)..... **$164.88**
310A (12" amber)..... **$199.88**

PRINCETON GRAPHICS

HX-12

The **HX-12** is one of the finest RGBs available for the IBM PC. Features 16 colors, .31mm dot pitch (NEC's tube), 690 dots by 240 lines interlaced & 15MHz bandwidth. Comes with its own cable.

PGS has two new monitors: the **SR-12**, similar to the HX-12 but with 32 colors & true 480 non-interlaced resolution (without flicker), & the **Max-12** is an amber monitor with TTL input (IBM monochrome adapter input), 18MHz bandwidth & 720 x 350 lines.
PGS HX-12..... **$499.88**
PGS SR-12..... **$CALL**
PGS Max-12..... **$CALL**

QUADRAM

QuadChrome

The **QuadChrome** has the same spec's as the HX-12. Same price too.
QuadChrome..... **$509.88**

Quadram Video Boards

QuadColor-1 ..... **$199.88**
QuadColor-2 ..... **$219.88**

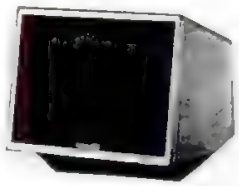
USI/PARADISE

MultiDisplay

The **Multi-Display** combines both monochrome & color/graphics boards into a one-slot operation. It supports 32K graphics, with composite (NTSC), Medium-Res RGB (300H x 200V) or TTL/monochrome (9x14 char & 8x8 char display)... ***and*** a parallel printer port.
MultiDisplay..... **$479.88**

Roland DG MB-121

We didn't discover these per se...a customer of ours raved about their clarity, the quality of workmanship & the specs. We saw them at a trade show & agreed. The **MB-121** features a 12" diagonal screen, 80 col x 25 line display, an 18MHz bandwidth, 640 dots horizontal by 200 lines vertical resolution & composite video input (NTSC) with an RCA cable included.



The **MB-121** comes in green (G) or amber (A) with a 90 degree angle & non-glare surface. We expect a TTL-type monitor (IBM PC monochrome compatible) shortly.
Roland DG MB-121G (12" Green)..... **$174.88**
Roland DG MB-121A (12" Amber)..... **$179.88**

PLANTRONICS

ColorPlus

Like the above, **ColorPlus** supports TTL/Monochrome or RGB output, & comes with a parallel printer port. Sharp graphics program included.
ColorPlus..... **$439.88**

TECMAR

Graphics Master

The **Graphics Master** supports TTL/Monochrome (720H x 700V), RGB (to 720H x 480V non-interlaced) or NTSC composite output. A 128K display buffer can be used as system memory in low-res modes.
Graphics Master..... **$579.88**

Modems

DC HAYES

Smartmodems

The **Smartmodems** are originate/answer, auto dial/answer, full/half duplex modems that run at either 300 or 300/1200 baud. Modular phone cable & power supply included. An RS-232C cable is optional.

The **1200B** is a 300/1200 baud internal modem for the PC. It includes all the features above, plus ***Smartcom*** software. It requires no additional RS-232C interface.

"Stack" Smartmodems
300 baud..... **$229.88**
300/1200 baud..... **$539.88**
1200B w/Softcom II **$459.88**

US ROBOTICS

Password
PC Modem
PC Modem 256

All these modems are compact, LSI-designs with 300/1200 baud capability. Features include: originate/answer, direct connect, auto dial/answer, auto mode/ speed select, full/half duplex (local echo) & audio phone line monitor.

The **Password**, an external device, comes with an RS-232C cable (specify male or female DB-25), power supply & modular telephone cable.

The **PC Modems** are plug-in boards that come with 64 or 256K RAM, a parallel port & real-time clock with a battery back-up.
Password..... **$379.88**
PC Modem ..... **$CALL**
PC Modem 256..... **$CALL**

Peripherals

AST RESEARCH

MegaPlus II

The **MegaPlus II** has a parallel port, an RS-232C port, clock & memory to 256K. Software included.
64K MegaPlus..... **$309.88**
256K MegaPlus..... **$509.88**
256K MegaPak..... **$329.88**
Optional #2 RS-232C Port..... **$49.88**
Game Port..... **$49.88**

SixPak Plus

THe **Sixpak** has an RS-232C port, a parallel port, clock & memory to 384K. Software included. An optional game port is also available.
64K Sixpak..... **$289.88**
256K SixPak **$469.88**
384K SixPak **$659.88**
Game Port **$49.88**

QUADRAM

Quadboards

The **Quadboard** has an RS-232C port, a parallel port, a clock & memory to 256K (you can also get your **Quadboard** "naked," with no memory installed). QuadSpool/Drive software is included with every **Quadboard**, along with a one-year warranty.
Quadboard 0K..... **$224.88**
Quadboard 64K **$284.88**
Quadboard 256K..... **$434.88**

Quad 512 +

Quad 512+s have a single RS-232C port on them, & sockets for up to 512K RAM. QuadSpool/Drive software is included.
Quad 512+ (64K)..... **$239.88**
Quad 512+ (256K) ..... **$CALL**
Quad 512+ (512K) ..... **$CALL**

Quad I/O

Quad I/O have a parallel port, an RS-232C port, game port & clock. Software included. An optional second RS-232C port is also available.
Quad I/O..... **$CALL**

Single Function Cards
Parallel Card w/cable **$89.88**
RS-232C Card **$89.88**
Clock/Calendar Card..... **$89.88**

QuadLink

QuadLink is like having an Apple computer on one board, with 64K. **QuadLink** takes up only one slot. Add $20 for Columbia MPC or Compaq computers when you order.
QuadLink..... **$499.88**

Drives/Controllers

Tandon
(320K) Double-sided..... **$239.88**
Maynard Electronics
Disk Controller **$159.88**

Hard Disks

QuCeS External Hard Disk
12MB..... **$2099.88**
20MB..... **$2339.88**
26MB..... **$2509.88**
Quadram Internal Hard Disk
12MB ..... **$CALL**
20MB ..... **$CALL**

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20Mb Disk/Tape **$3339.88**
35Mb Disk/Tape **$4669.88**
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- We accept CODs up to $1000 (add $10 handling fee per order) payable with certified check or money order. Company Purchase Orders are accepted on a limited basis & upon approval only. Sorry, no APO or foreign orders accepted. We have a $50 minimum order.
- All our equipment is shipped with full manufacturer's warranty. We are an ***authorized dealer*** for all products we sell to insure full warranty support, & we're authorized for warranty work on a number of printers. We offer extended warranty plans for many printers.
- We prepared this ad in November, & prices do change, so call to verify them.
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The lower cost and higher performance are all made possible by a totally new control technology that allows simple, inherently more reliable stepping motors to run at much higher speeds. The design eliminates lots of parts that you find in other serial printers. Parts you don't have to pay for and, just as important, parts you don't have to maintain. Primage I features simplified controls, easy paper feeding and a wide choice of fonts. It also comes with a unique 100-spoke daisy wheel that provides switch selectable multiple languages, and an easy access, easy set-up interface that connects in seconds to IBM PCs, PC compatible micros and other popular personal computers.

When you compare Primage I with top quality daisy printers and sheet feeders that cost up to 50% more, we're confident you'll make the same choice your computer would. So come into your computer dealer today for a first hand demonstration. Or contact us for detailed product literature. Primages Inc., 620 Johnson Ave., Bohemia, NY 11716 (516) 567-8200.

PRIMAGES INC.

CIRCLE 134 ON READER SERVICE CARD

Letters To PC

On The Cheap

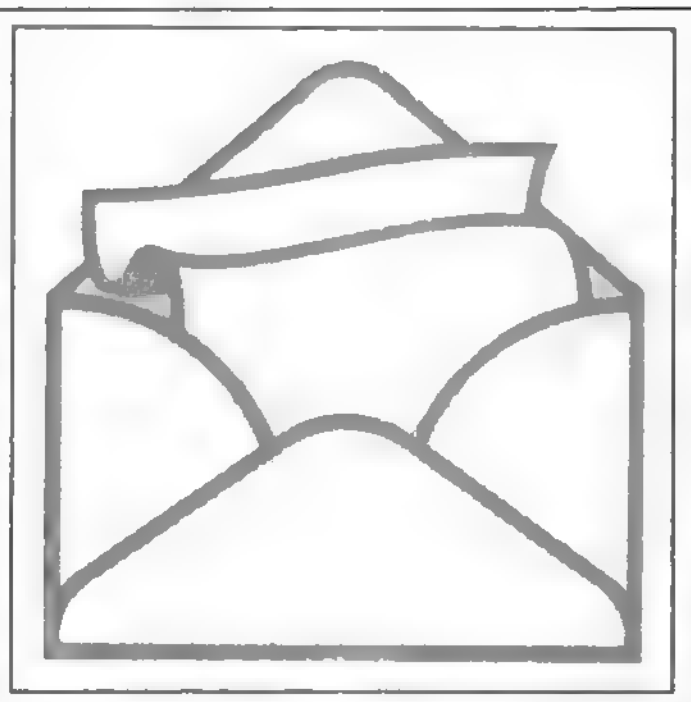
The photograph accompanying the vignette about John Bertl, a self-styled commodity trader/home consultant, reveals an interesting but unfortunate situation. It appears that Bertl has photocopies of manuals for *1-2-3*, two versions of *MultiPlan*, a MacroAssembler, and DOS 2.0, among others on the shelf next to his PC. If a man who has enough capital assets to lose $50,000 in one day of trading feels he can't afford to buy software, who can?

David John Buerger
Santa Clara, California

Doing Their Homework

I just finished reading the cover story in the latest issue of *PC* ("There's No Work Place Like Home," *PC*, Volume 2 Number 7) and was struck by a sense of déjà vu. Graeme Thickens' comments, in particular, hit home. My wife and I chose to operate our business from our Seattle home for similar reasons: low overhead, the ability to choose our own work hours, increased comfort, and convenience.

We think Thickens' point concerning *EasyWriter 1.1* is right on target. We have used *EasyWriter* for all our document needs, including standardized invoices, for almost 2 years, and we have yet to find software that makes creative writing any easier. Most word processing software that we have tested devotes its energy to form at the expense of content. The simple act of transferring your creative thoughts to the screen is interrupted by numerous editing command levels that dictate the look of the printed page. For us, these



delays can be enough to erase a thought before it's committed to the disk.

EasyWriter editing commands are logical and easily reached. If you don't like the finished look of your document, you can always edit and reformat it after the initial creative work is done.

EasyWriter is no speed demon. If I derived my livelihood from running a word processing business, creating intricate forms, or mail-merging numerous letters, I'd choose *WordStar* or one of its various competitors. But my recommendation to writers concerned with writing is to give *EasyWriter 1.1* a fair trial.

Mark Phillips
Seattle, Washington

Challenging Captain Grace

After reading the interview with Grace Hopper, I had to check to make sure I hadn't picked up a copy of *Mainframe Monthly* ("Keeping Up With Grace," *PC*, Volume 2 Number 7).

Hopper can't find any uses for Pascal? I use it for every application program I write, from accounting software to programs that track the United States Congress. In the same issue of *PC*, Peter Norton called Pascal "the best general-purpose programming language." Microsoft chose Pascal to write both the Pascal and FORTRAN compilers. I challenge Hopper to write a micro compiler in COBOL.

Then it struck me: Hopper is from the Navy, the branch of our armed services that persists in building multimillion-dollar vessels that can be destroyed by multithousand-dollar missiles, and that pays $2,000 for $20 wrenches.

Don't get me wrong. I'm sure Hopper can program a PC in COBOL. But I'd love to sell her a wrench.

P. Adrian Z. Calta
Washington, D.C.

Housing Crisis

I enjoyed reading "Real Software For Real Estate" by Bil. Alvernaz in the December issue (*PC*, Volume 2 Number 7). I had tried out *Property Management* by Continental Software Company a short while ago and was impressed with it.

However, I discovered one very serious problem that was not mentioned in the article. I found, and the people at Continental Software confirmed, that there is no way of handling more than one record for a given apartment. For example, the program cannot accommodate a situation like this: Tenant A has moved out of the apartment within the last few months; tenant B is the current occupant but is moving out at

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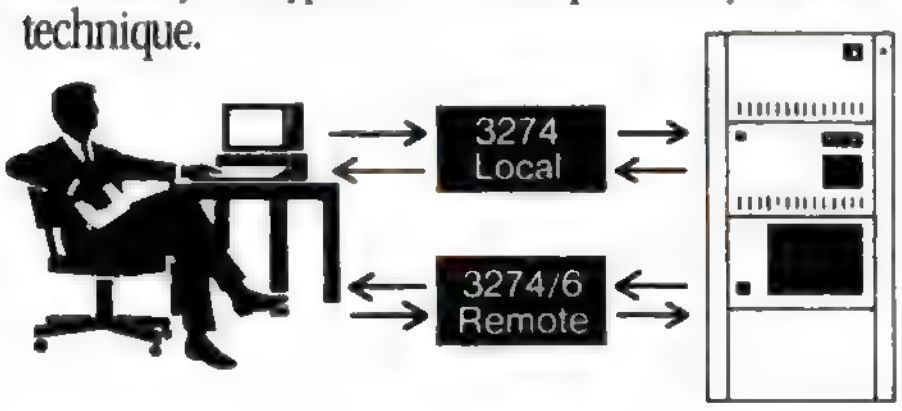

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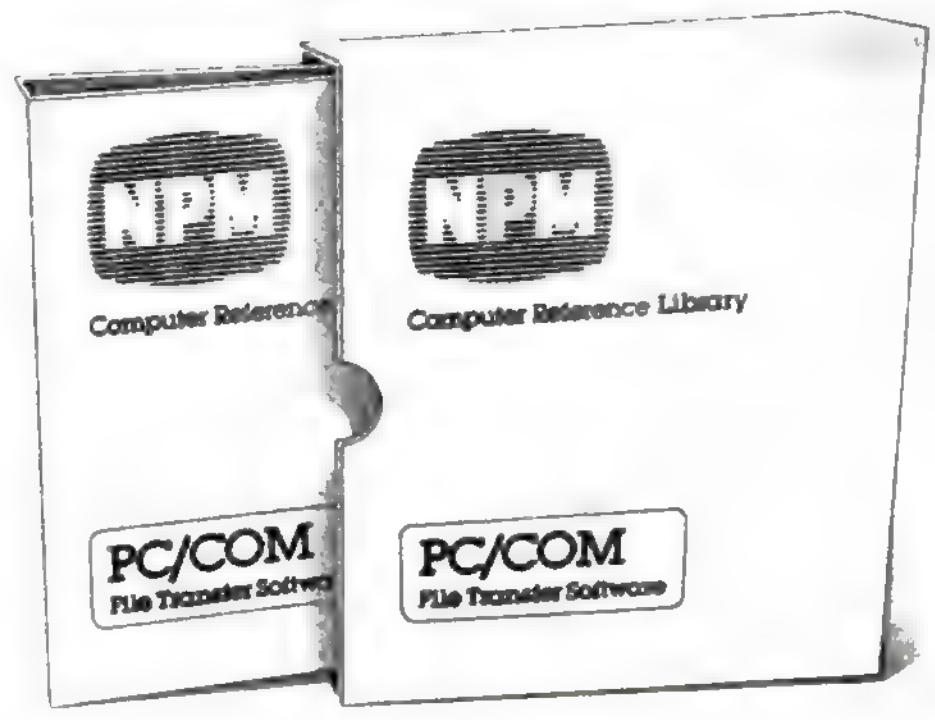

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CIRCLE 805 ON READER SERVICE CARD

the end of this month; tenant C has put down a holding deposit on the same unit and will be moving in shortly after the first of the month.

The only solution Continental Software could offer was to use dummy or "ghost" apartments for the former and incoming tenants. This is unacceptable to me and defeats the purpose of computerized property management software. It's also not good accounting practice. Does anyone know of any accrual basis property management software that will allow more than one record for a given unit and that allows for booking various charges to tenants?

Laura S. Cline
Holliston, Massachusetts

We don't know of any packages that fit the bill, but we invite readers in the real estate market to help out.—Ed.

Back It Up!

In the article "There's No Work Place Like Home," I found John Bertl's comments very interesting. I have six PCs installed at my office and have had no problems with any of them. Three of these are terminals on our IBM S/34, so they get heavy use.

Looking at the picture of Bertl and his PC, it appears to me that he may have an airflow problem with the systems unit because of the way it is enclosed.

If I stood to lose $50,000 because my PC was down for one day, I think I would invest in a backup system unit. And if I could make $50,000 in one day, I could surely afford a backup!

Janice Fielder
Davie, Florida

Equal Time for Mail Order

I read with great interest the article "Mail Order And Disorder" in your December issue (*PC*, Volume 2 Number 7). In particular, I noticed two ironies about the inclusion of that article.

In the same issue I counted 148 full pages of advertising from firms that take orders by mail or telephone, including IBM Direct. I would also like to point out that you sell magazines by mail. Do the concerns in the article apply to you as well?

I agree that there are some direct marketers in this industry—and every other industry—that do not provide the kind of customer services they should. Their unprofessional practices cause problems for all direct marketers. However, your article would lead the reader to be cautious about buying anything by mail.

I demand equal time. Let's have an article about the benefits of buying by mail.

Gary Skidmore
Select Marketing
Round Rock, Texas

If "Mail Order And Disorder" leads the reader to be careful about buying mail order products, then it has served its purpose well. The fact that PC *does contain advertisements from mail order houses and that the magazine itself is sold through the mail, demonstrates that we don't think mail order is intrinsically bad.*

*We haven't ignored the benefits of buying through the mail. See, for example, "Down By The Old Mill Stream" (*PC, *Volume 2 Number 2) about PC Connection.—Ed.*

The Future of BASIC

It was great to read Paul Somerson's interviews with the Microsoft people ("In Defense of BASIC" and "The Microsoft Touch," *PC*, Volume 2 Number 4). I have some comments on the future of BASIC myself.

I have written dozens of programs in Microsoft BASIC, some of them on early CP/M machines and the latest ones on an IBM PC. I have also been teaching the language to people with no programming knowledge.

Of all the languages now in existence, BASIC is the only one suitable for end users. But should end users program at all? Ultimately, the answer will be no. Better tools will be available, precluding any need for users to learn hard, unforgiving programming languages. For now, though, a user with some programming knowledge has a tremendous edge. For example, in one of my classes we wrote a BASIC program to create a database that we imported into various applications, including *dBASE II* and *1-2-3*. It was simple and fast. The alternative would have been entering several thousand records by hand.

I find BASIC's lack of proper subroutines with local variables onerous. I was tremendously relieved to read that Mark Chamberlin from Microsoft has recognized this as the most needed feature in Microsoft's BASIC. Once that feature is added, along with proper labels and multiple line IF . . . THEN statements, Microsoft BASIC will be a candidate for some serious applications.

Jake Ever
Rye Brook, New York

Sleepless Nights

I've been losing sleep lately because I don't think Stephen Manes would like me if he met me. You know Manes; he is the author of the review of North American Business System's *Memory/Shift* ("Memory/Shift: Two Heads Are Not Necessarily Better Than One," *PC*, Volume 2 Number 4).

As the manager of the only mail order house authorized by NABS to sell *Memory/Shift*, I have been personally responsible for the sale of hundreds of copies of *Memory/Shift* to what I suspect Manes would describe as the unsuspecting public. He'd probably like to punch me in the nose. This "absent-minded" program, as Manes describes it, must surely have caused irreparable damage. I wonder if he feels the same way about the PC. Personally, I'd like my PC a lot better if it came in my favorite color, red, could whistle Dixie, and served my morning coffee.

George Gamard
Microhouse
Bethlehem, Pennsylvania

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PC Takes Over

As a loyal *PC* fan, I'm writing to tell you that your readers are exhausted. Physically, we're worn out from hauling your publication around in our briefcases. Mentally, we're beaten from the overload that each issue brings. Those of us who once thought that the PC was a tool to aid us in our careers have found instead that keeping up with the PC has become our career.

When my company got its first PC, I allocated a small segment of my brain to learning about the machine. The major portion of my brain, however, I reserved for keeping up with developments in my professional area of expertise, employee benefit plans. That was a year ago. The minute the first issue of *PC* arrived, I knew I would have to revise the allocation scheme. Over the last 12 months, the PC segment of my brain has been inexorably devouring the rest. I no longer know anything about employee benefit plans. In the evening, I come home and stare blankly at my wife, whose name I can no longer recall.

Make no mistake. I have no quarrel with the information in your magazine. I'm devouring it as thoroughly as it's devouring me. The October issue, which was about all the things that can go wrong, needs only minor revisions to become my autobiography.

Oops, gotta run. The building manager just called. The floor of the computer room just collapsed. Something about a pile of magazines . . .

Michael L. Kramer
San Francisco, California

Misleading Monitor

In an attempt to kill two birds with one stone, I recently spent a large sum of money to buy a Zenith System 3, which is a high-quality, 19-inch, cable-ready color TV that supposedly can be used as a monitor for a computer. I attached it to my cable system and VCR, and it displayed an excellent image. However, when I attached it to my IBM PC (with color/graphics adapter), the results were terrible. The characters were barely identifiable and the color quality was poor.

The salesman at the local TV store at which I bought the set suggested that the screen may be too large to display a good image, or perhaps it wasn't designed to be used as a monitor at all. I even brought my PC to the store, and we tried it with other "monitor" TV sets, but the results were only slightly better. The store had no answer for me.

Is there any way to get a good image from such a monitor or am I stuck with an expensive TV set?

John A. Horn
Pleasantville, New York

There are a few monitors which will display color programs and color graphics equally well. Look for our findings in an upcoming issue.—Ed.

Basic Books for BASIC

I have seen many books that try to teach BASIC, but they always leave you stuck on one chapter while they go on to the next. It's very frustrating when they say, "That was easy, wasn't it?" and you haven't understood a word. Do you know of any books written in plain English? I am 12 years old.

Andrew Herr
Penetanguishene, Ontario

We've also seen dozens of books that claim they'll teach you BASIC. Many are just rehashes of the IBM BASIC manual. IBM sells a software tutorial that will teach you the ropes, and if you plug away at virtually any of the books you'll eventually figure it all out.

The only real way to learn is with hands-on experience. IBM's BASIC manual was not meant to be a tutorial, but many people who are now experts did learn from it. First, plod through the introductory material at the front of the book to learn how to use the keyboard, load and save and run programs, etc. Then look at each of the commands, functions, and statements in the main body of the text, and type and run each of the examples. *Then, change the examples slightly and see what happens. For instance, if an example in the manual is:*

```
10 SCREEN 1
20 CIRCLE (160,100),60,,,,5/18
```

try changing the numbers in the parentheses to (170,90), or the one right after the parentheses to 40, or the fraction at the end to 7/18, and watch what happens when you run it. You'll not only begin to understand how the thing works, but you'll get a feel for what range of numbers works best in them.

Our other suggestion is to join your local IBM user group. Many user groups have a beginners BASIC sub-group where you can meet people who are also learning, who know some things you don't know and can teach them to you. Also, at such groups you can find real experts who can answer tough questions.

If you don't know the basics of BASIC—if lines like: N=N+1 don't make sense—you may want to buy yourself a kid's book that explains such fundamental notions. Go to your local bookstore or computer store and pick up one or two aimed at real beginners and see if you can follow them, then buy the one or two that seem clearest.

Also, read columns such as "PC Tutor" and "User-to-User." These can teach you things not found in manuals. And magazines such as PCjr. *or* Creative Computing *can also be very instructive for the beginning or intermediate programmer.—Ed.*

Roll-Your-Own Spelling Checker

In the last few months, I have had to put together a dictionary on a disk for a program that I am in the process of finishing up. My dictionary has grown to 215K and contains just over 24,000 words. I stored the words in sequential format separated by a carriage return, all in lowercase

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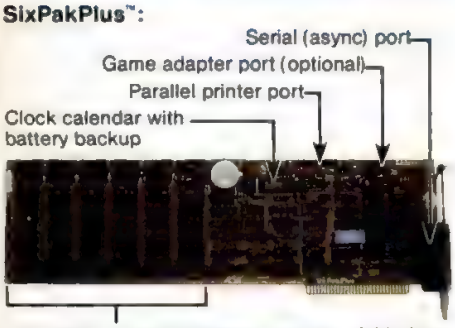

64K-384K of parity checked memory. Added to a PC or XT with a fully populated 256K system board, the SixPakPlus can bring the system memory to 640K, the maximum addressable user memory.

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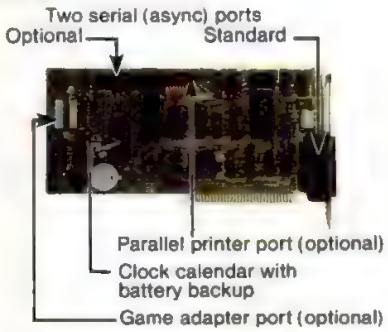

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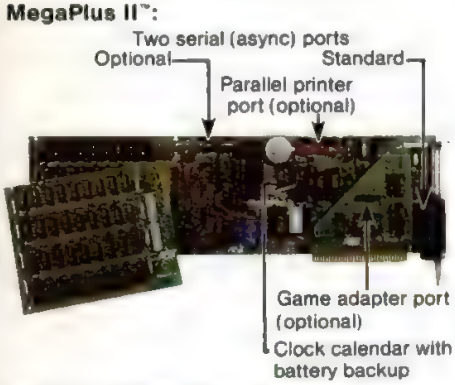

64K-512K of parity checked memory. The basic card expands to 256K, and with the MegaPak extension expands to an additional 128K or 256K of parity checked memory.

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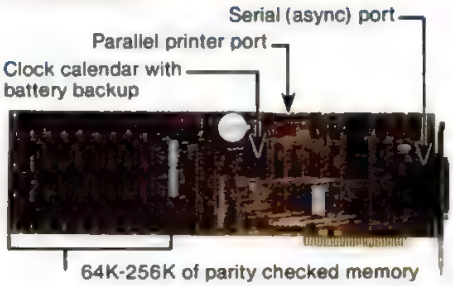

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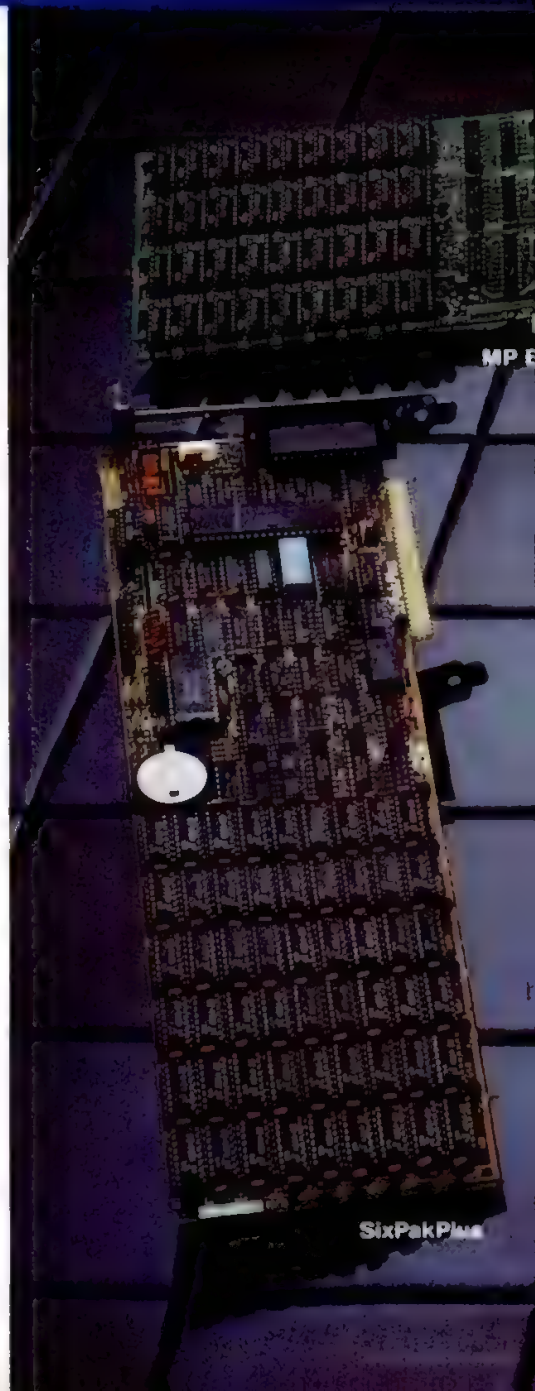

User Memory from 64K-512K — When added to your existing system memory, brings your PC up to its maximum of 640K. You can run larger spreadsheets or create larger in-memory databases. You can also use the additional memory along with the supplied AST SuperPak™ software which includes SuperDrive™ and SuperSpool™.

Serial Ports — Using a modem your PC can communicate with other computers over telephone lines. By connecting a serial printer, you can obtain high quality print output. Other serial devices such as a plotter or mouse may also be connected to a serial port.

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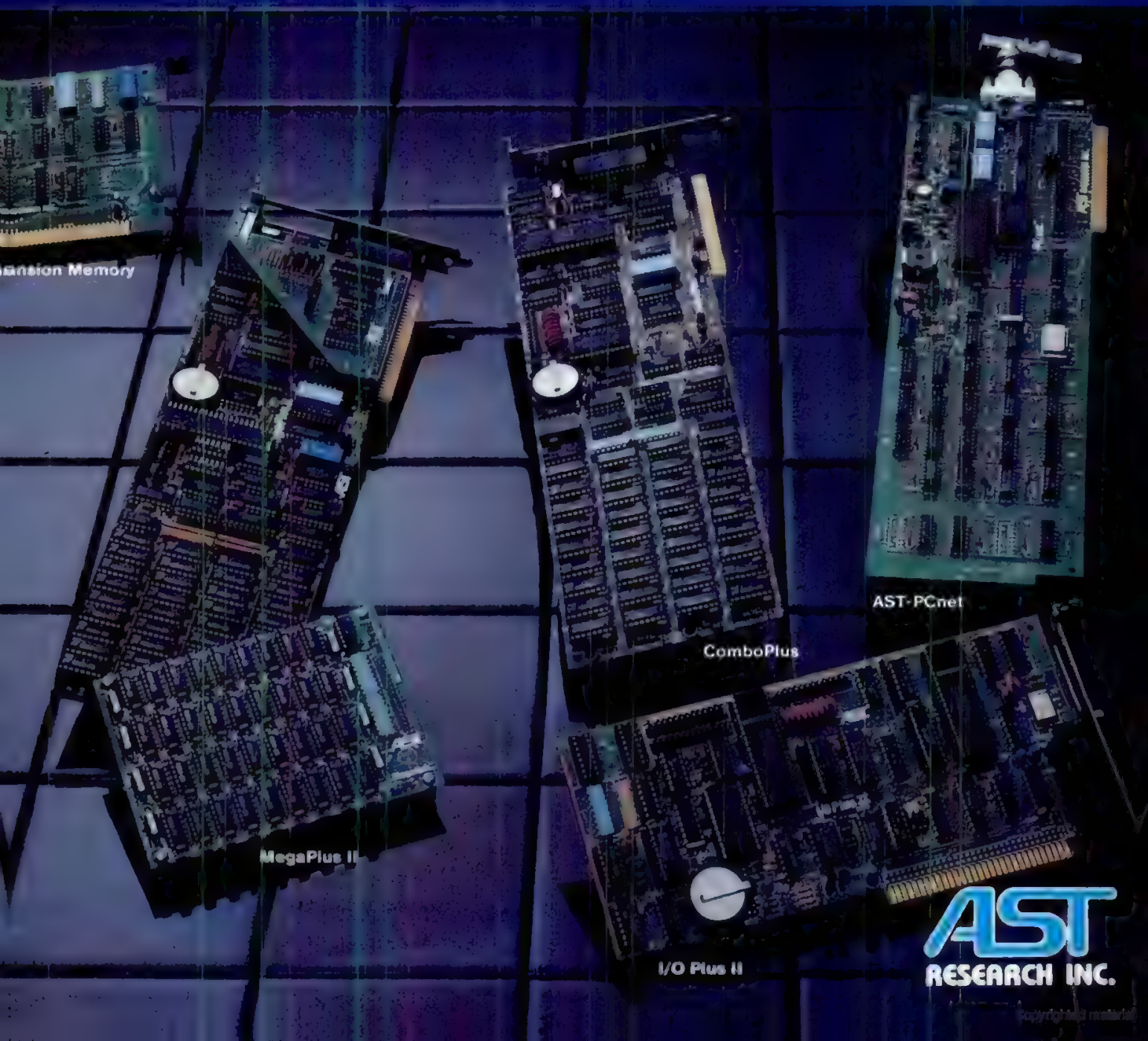

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except the proper nouns and a few standard abbreviations.

Many of my friends who have computers wish they could get hold of an unprotected file of words, but none want to take on the timely and costly task of entering them—and I could give you more than 24,000 reasons why they are right.

This dictionary file is serving me well, which is all I had in mind when I sat down and started to enter it. I've decided that if it can benefit others, I am more than happy to share it.

A $7 check or money order will cover the cost of the disk, duplication, and postage. If user groups or individuals want to make copies for all their members or friends, that's fine with me. Readers who are interested can send the $7 to me at P.O. Box 554, Berea, OH 44017.

Thanks for taking the time to listen to a reader.

Brian Demkowitz
Berea, OH

The First PAC-man

Does the title of "the world's first personal computer" belong to SCAMP? That is the claim made by Paul J. Friedl in his article, "SCAMP: The Missing Link In the PC's Past?" (*PC*, Volume 2 Number 6), about the machine he developed at IBM 10 years ago. I am unfamiliar with his machine and found the story interesting, but I think the credit for being first belongs to another computer.

Thirty years ago (that's 20 years before SCAMP), there was a well-qualified candidate for the title: the Personal Automatic Calculator (PAC). PAC was designed by John J. Lentz at the Watson Laboratory that IBM maintained for many years next to Columbia University in New York City. Lentz described his engineering model in December 1954 in an internal report, and the machine was announced in September 1957 as the IBM 610 Automatic Decimal Point Computer. I claim the small distinction of having once played with that machine.

The 610 was a personal computer in the sense that it was designed, at the lowest cost for that time, to be operated by one person. The vacuum-tube machine had a keyboard for input, a small CRT display, and an electric typewriter for output. Numeric data were stored in 84 "registers" on a magnetic drum. Arithmetic was decimal fixed-point. To enter a number, only the significant digits and the decimal point had to be keyed in; the machine would align the point and fill in the missing zeros—hence its name. The machine could be set up to capture the operator's keystrokes on punched paper tape. The tape could then be read back to supply the operations and constants for subsequent iterations, with the operator entering only new values for the input variables. The tape could also be used for data storage. Fixed subroutines could be prewired on a small plugboard.

Priced at $55,000, the 610 was not a home computer, nor was it a stored-program computer in the strictest sense of storing the instructions on the same medium as, and intermixed with, the data. In many ways, its functions corresponded with those of the more elaborate hand-held calculators of recent years. But the distinction between calculators and computers is rather blurred, and John Lentz targeted an individual scientist or engineer as the user. He thus deserves serious consideration as the inventor of the world's first personal computer.

Werner Buchholz
Wappingers Falls, New York

DIG SIG Notes

I just returned from COMDEX, where I underwent appropriate conditioning by carting around all the giveaway material I collected while walking the 13.3 miles it took to cover all the exhibits. I used my new-found endurance to lift your December issue and turn to one of my favorite features, "Letters To PC."

I was pleased to read the letters regarding handicapped computer users and your offer to serve as a bulletin board. I wanted to let you know that since Dona Z. Meilach's story on my group, Disabled Interest Group/Special Interest Group (DIG SIG), appeared in the June issue ("Helping The Handicapped Through Computers," *PC*, Volume 2 Number 1), we have received numerous requests for information and assistance, which we have been pleased to provide. We are currently aiding groups in several cities to organize their own local disabled interest groups.

One of your readers inquired about a version of your magazine that could be enjoyed by the visually impaired. I have several suggestions. Short of using an Opticon or similar device, visually impaired people might inquire in their area to find someone with an OCR, with which they might be able to read your fonts and copy to disk. Having done so, there are several simple voice synthesizer programs that could read the material aloud. In fact, visually impaired people could buy *PC Disk Magazine* and do the same.

I would also like to commend firms like RoseSoft and PEK for extending themselves to accommodate disabled computer users. We work with several companies that are attempting to make their products similarly adaptable, and we would be pleased to hear from anyone who would like our assistance in modifying their product.

Finally, we have had our bulletin board system running since August. Our number is (619) 268-0437. We operate 24 hours a day at 300 baud on an IBM PC system. I am the system operator; in addition to being chairman of the DIG SIG, I am active with the IBM PC SIG, so this system serves both groups. We are hoping to soon dedicate a bulletin board system exclusively to the disabled and to those who work with handicapped people.

Milton Blackstone
La Jolla, California

Correction

The price for *Property Management* by Continental Software Company is $495, not $695 ("Real Software For Real Estate," *PC*, Volume 2 Number 7).

Next April 15th, you could be adding up your golf score instead of your taxes.

With your IBM PC and Best Programs' TaxCut™ program, you can use the long days and nights you used to put into preparing your taxes for something more enjoyable.

TaxCut includes two second-generation programs, one for tax preparation and the other for tax planning, pioneered and refined by tax and programming experts—and by PC users like you. With step-by-step, on-screen prompting, the tax-preparation program helps you prepare and print the 1040 long form and more than 30 other commonly used forms and schedules.

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TaxCut also includes a tax planner program that allows you to decide for yourself whether or not to set up an IRA, what effect a new mortgage will have on your tax liability, and the tax implications of a wide variety of other financial alternatives.

TaxCut is compatible with the IBM PC, the PC/AT and the COMPAQ computer. The program requires at least 128KB memory and one double-sided diskette drive. Add Best's Professional Finance Program (PC/PFPII), which tracks and computes data for input into TaxCut, and you have a complete financial and tax package.

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Next April 15th, you'll be very glad you did.

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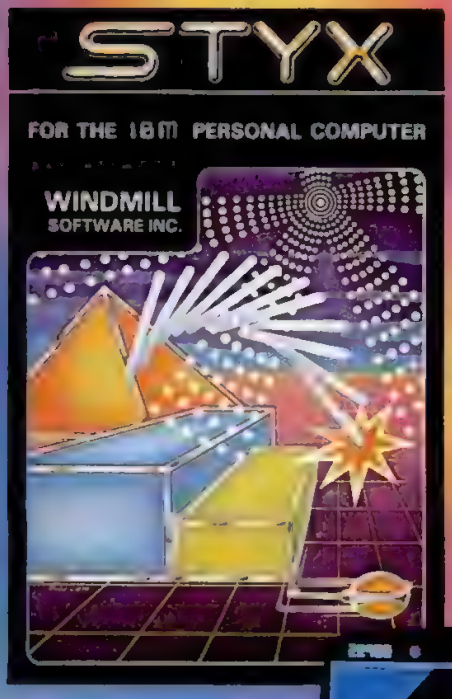

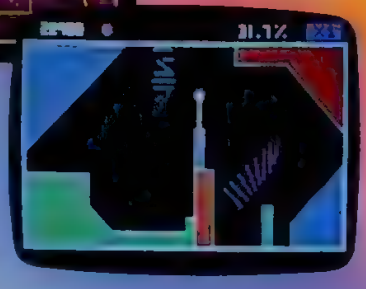

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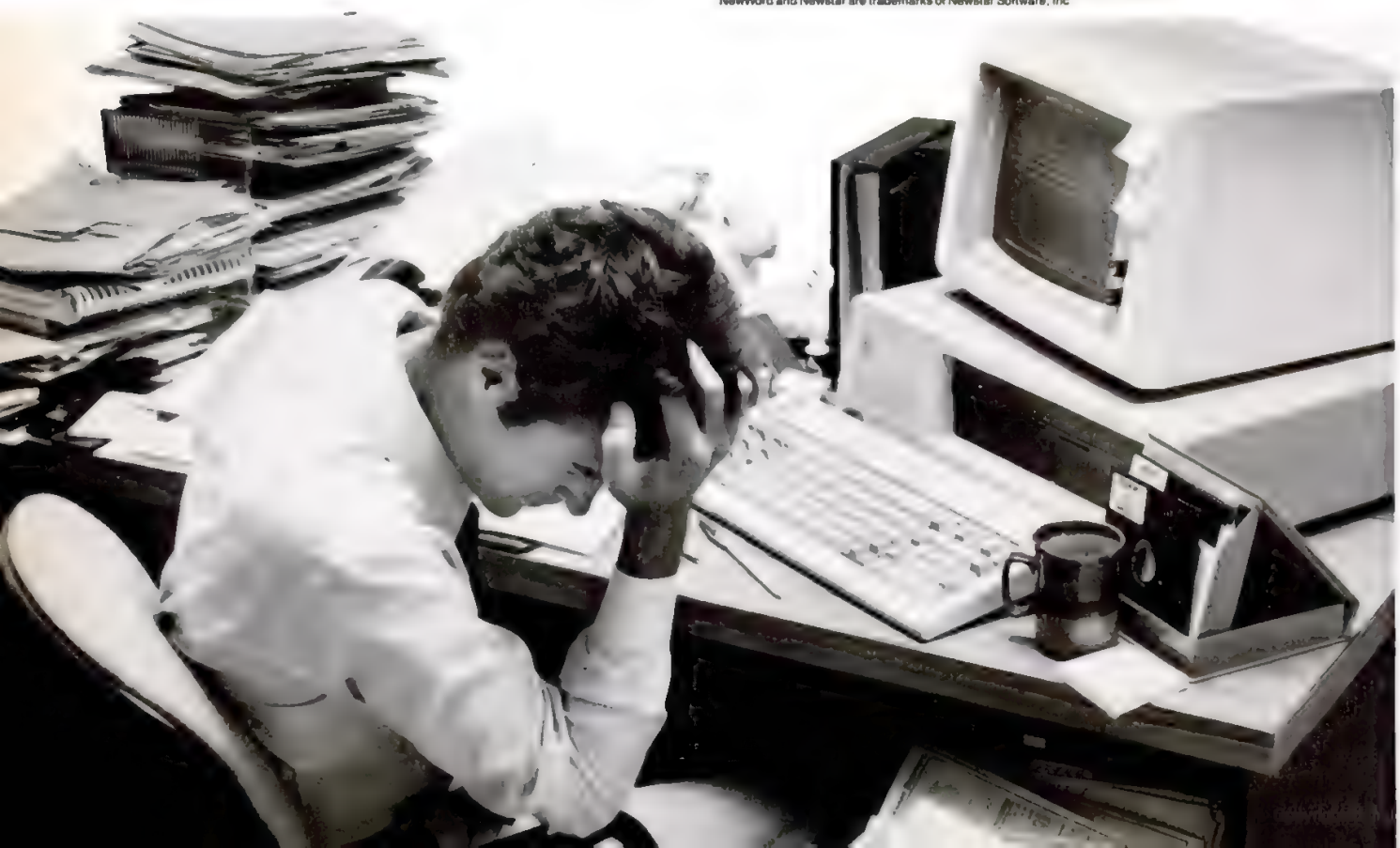

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MOUSE, INSPIRED BY SCENT OF PERFECTLY AGED CAMEMBERT CHEESE, GNAWS THROUGH SPREADSHEET, ONLY TO DISCOVER HE HAS BEEN FOOLED BY AROMA OF OVER-RIPE GORGONZOLA (G).

IN A FIT OF PIQUE HE SPILLS VINTAGE WINE (H) INTO WATER-WHEEL (I) WHICH TURNS PULLEY THAT CAUSES GLOVE (J) TO GRASP SPREADSHEET AND MOVE IT TO TAPING AREA.

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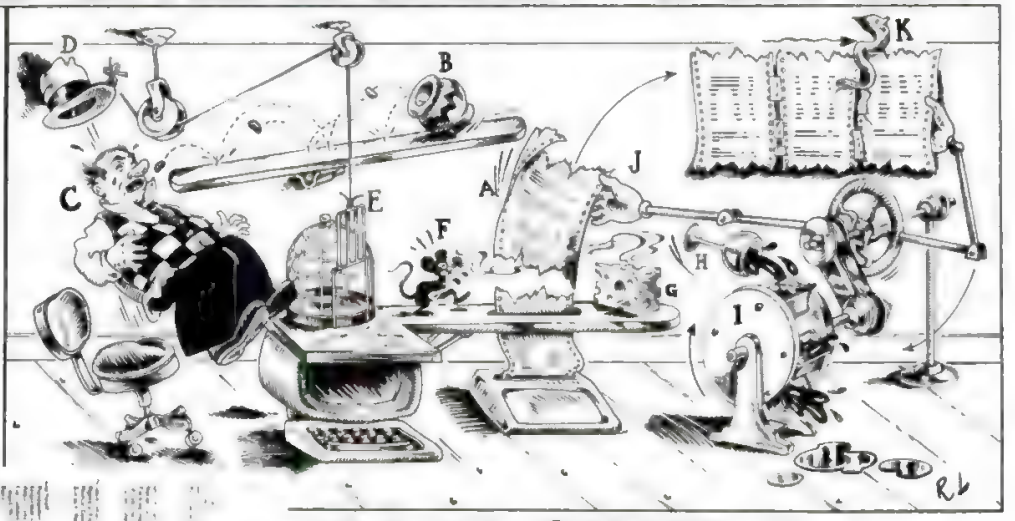

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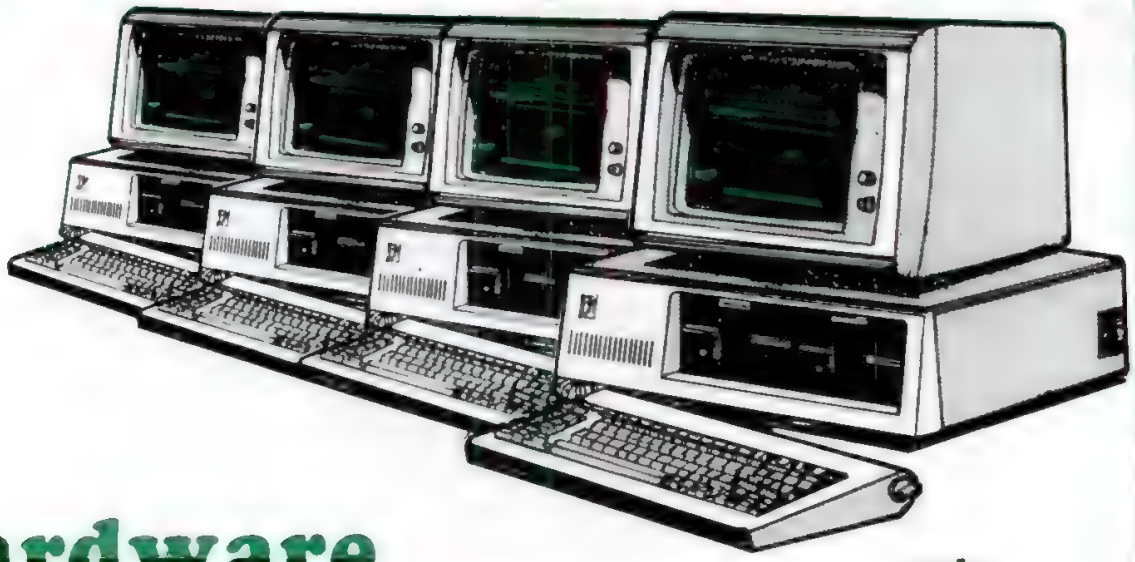

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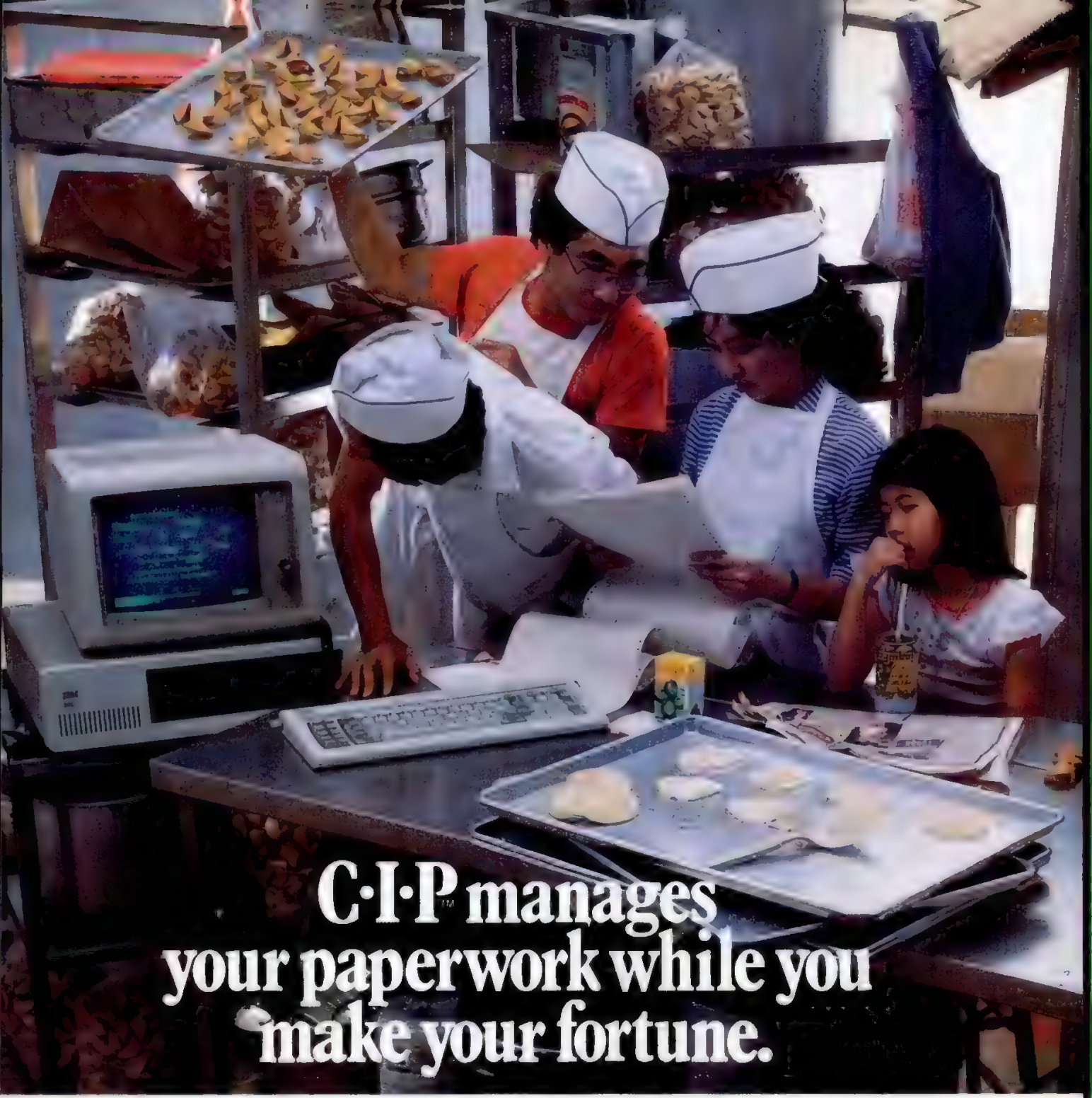

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The IBM PC Phenomenon

IBM knew that protectionism wouldn't pay. As the PC family grows, its open-system architecture continues to attract buyers and vendors alike.

Personal computers in various forms have existed since 1975. The potential of the early machines, however, was unforeseen at that time, even by their designers. These computers were given unpretentious names by their manufacturers, such as TRS-80, Apple II, and Commodore 64. Those of us already involved in the computer industry knew that these were microcomputers, but many of us scoffed at the puny, self-limited, and amateurish nature of the machines. The average person had no idea that these machines even existed, let alone what they could and couldn't do.

As the industry matured, the reputation of the machines evolved, too—no longer just hobbyists' toys, personal computers became widely regarded as useful home and business products. There were two major hallmarks of commercial success: enormous retail support, as with Radio Shack, and open architecture, as with Apple. Public awareness of the machines grew and demand for them increased on many fronts. In 1981, IBM introduced its first microcomputer: the IBM Personal Computer, or PC. Thus started the PC phenomenon as the microcomputer was opened up for universal applications.

Unrestricted Applications

The name "PC" carried no restrictions as to particular industries or applications.

Safi Qureshey

It was a personal computer for the individual, whether that individual was a doctor or lawyer, banker or stockbroker, chief executive of a large corporation or owner of a small business; the list goes on and on. The noncommittal nature of this machine positioned it well in virtually every market; there were no built-in biases or prejudices.

With the introduction of the PC, IBM demonstrated its traditional ability to learn from the successes of others by adopting an open system architecture. It proved its ability to innovate by basing the new machine on a 16-bit processor with a large addressable memory, even though the 8-bit market was still expanding.

All small systems existing prior to the IBM PC used 8-bit processors and could directly address only 64K bytes of memory. The IBM PC uses a 16-bit processor, capable of directly addressing up to 1024K bytes of memory, or 16 times the previous maximum. This feature gave application software developers the freedom to write programs that had not been feasible on machines with less memory.

Although not everyone would agree with IBM's selection of the 8088 as the processor of choice, it was undeniably better than anything that the 8-bit machines could offer. While many groaned at the slow 4.77 MHz clock speed of the new machine, IBM ensured that it would run with the slowest memory chips then available, thereby keeping the price within an acceptable range.

Accessible Architecture

The open-system architecture, encouraged from the beginning by IBM, is one of the most important reasons for the IBM PC's phenomenal worldwide success.

By failing to provide hardware schematics, interface specifications, and source codes, many small computer manufacturers discouraged other companies from building products that could be used in conjunction with their computer systems. A company in this situation becomes the only source for enhancements to its products. While this sort of

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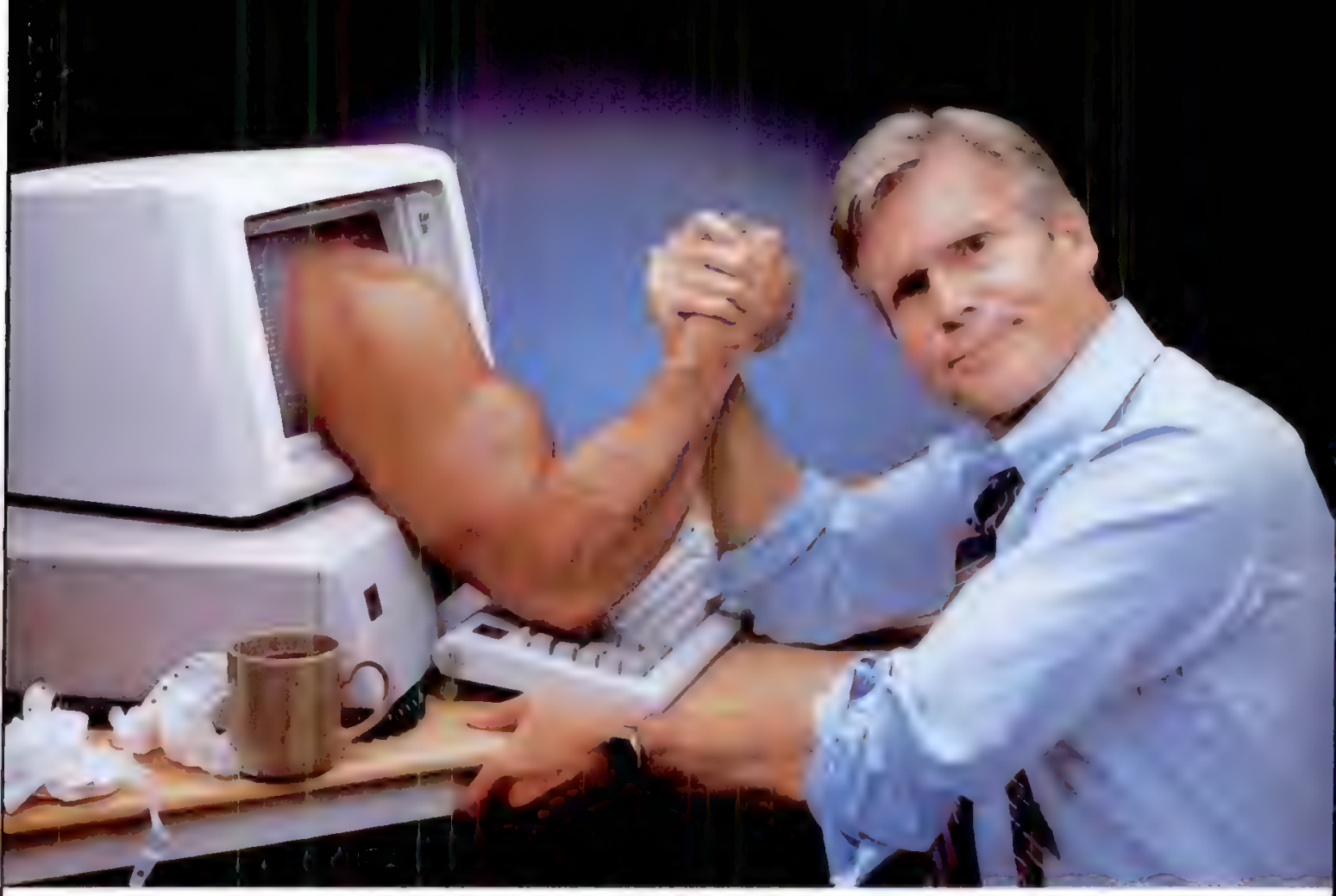

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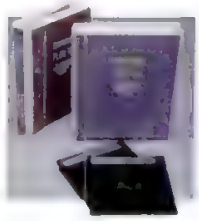

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protectionism would seem to be the ideal for a company that wishes to defend its machine against outside speculators, the reverse is often true: If there is insufficient demand for a machine, the revenues that it generates will be insufficient for a manufacturer to justify expanding and enhancing its hardware base and software selection.

Single-vendor support can be deadly even on a scale that would seem to be impervious to such effects. Witness the demise of the Texas Instruments 99/4A home computer. TI steadfastly held everyone else out of the add-on market and watched helplessly as enthusiasm for the machine waned. They were forced, time and again, to cut the price, and as a result the machine was no longer profitable (if, indeed, it ever was).

We have learned from examples such as this that no one company can envision, design, manufacture, and distribute the wide variety of products needed to meet the customers' demands in such a competitive market—not Texas Instruments, and not even a giant such as IBM.

Many of the new application programs that have accelerated the demand for and popularity of the IBM PC were made possible by companies such as AST Research, Tecmar, and Tallgrass Technologies (among others), who developed products to expand the memory, I/O, and storage capacity of the IBM PC long before IBM did. The wag who suggested that Lotus' *1-2-3* has sold more IBM memory and color cards than all the retail salesmen was only half kidding.

While IBM has been reticent to sell and support software that requires large amounts of memory or a hard disk, other manufacturers have not. With the PC machine itself firmly under its control, if IBM had been the one to offer *1-2-3*, users may have accused the company of high-handedness and perhaps dismissed the program as a thinly disguised way to sell more hardware. In a free market, though, with scores of manufacturers competing on the PC bandwagon, the users are more than happy to buy whatever additional pieces are necessary, simply because they know that they have a choice.

Building a Family

Having paved the way for an entire industry built around one generic computer, the IBM PC phenomenon continues. Secure with the success of the original PC, IBM has expanded its appeal by spawning a family of PC machines that fill out a wide range of capabilities and costs. At the higher end is the PC-XT with 10 megabytes of storage and other extras, while the newly released PC*jr* is a low-end machine designed for home and school use, as well as low-cost business applications.

The burgeoning compatibles market attests not only to the health of the PC family's market, but also to the tremendous future for enhancement products.

Admittedly, the design of PC*jr* is less amenable to add-on hardware products than the original PC, but by no means does it rule them out. Firms in the aftermarket, however, regard PC*jr* as just one more technical challenge. They don't regard the design of the machine as a restrictive step by IBM, but merely as an effort to protect its market. As the PC*jr* aftermarket grows, it will be up to the consumer to choose the base machine that best suits his needs and then enhance it to meet his ultimate requirements.

With the XT and PC*jr* now available, the IBM personal computer market may begin to closely resemble some aspects of the domestic automobile market. Different versions of the same basic commodity are available, but a smaller and less expensive model can be "optioned out" to match or even exceed a larger model in price and performance. Think of all the automobile owners who wouldn't dream of having the standard, dealer-installed radio. Likewise, many computer purchasers seek the economies and performance improvements of multifunction cards and other add-on products.

Companies in the enhancement business will continue to give new dimension to the PC family by expanding, networking, and connecting them to larger, mainframe computers. Nowhere was the health of this market more evident than at the COMDEX show in Las Vegas this past fall. IBM was evidently helping itself as it helped others, conducting well-attended seminars for prospective software vendors. Their technical manuals for the new products provide virtually all the information necessary to build add-on equipment. Finally, the burgeoning compatibles market attests not only to the health of the PC family's market, but also to the tremendous future for enhancement products. The future may not be easy to predict, but if the present is any indication, the PC phenomenon will continue through 1984 and well beyond. ■

Safi Qureshey is the president of AST Research, Inc., one of the leading manufacturers of enhancement and aftermarket products for the IBM PC family.

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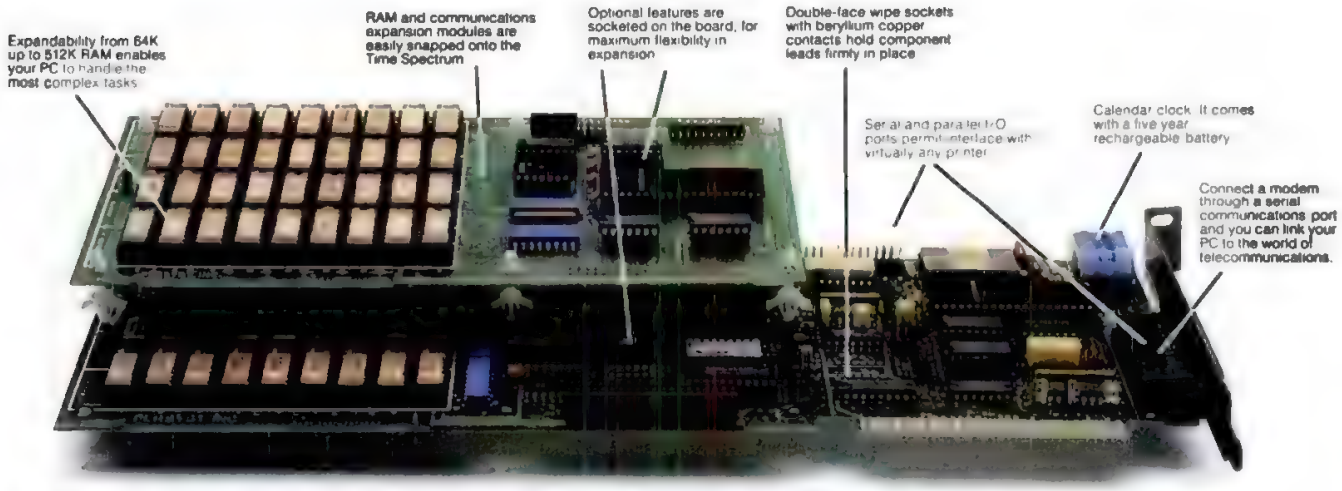

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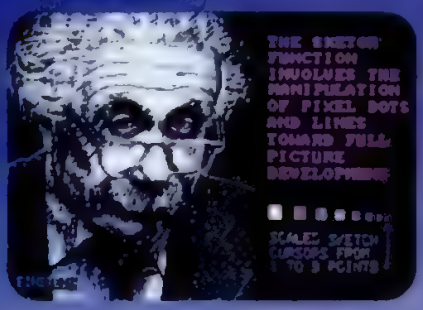

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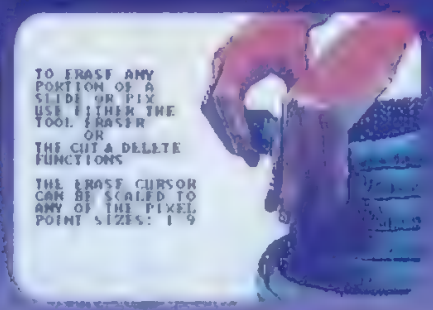

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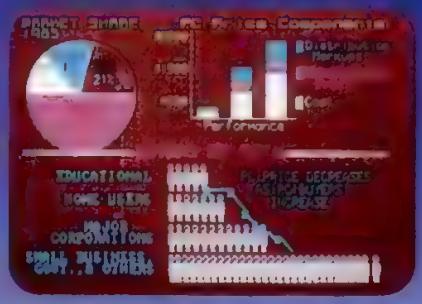

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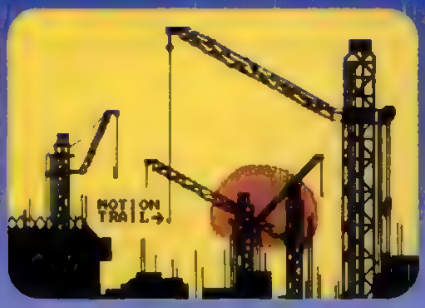

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More On Subdirectories

Subdirectories help you keep track of the hundreds of files that can be stored on hard disks. This is the first of a two-part series, where Norton explains what they are.

In alternating installments of this column, we've been covering various aspects of the file attribute byte. This is the byte that is used by DOS to control some aspects of files and disk management. The last thing that we discussed was subdirectories (which are identified by one of the bits of the file attribute byte).

We remarked how subdirectories are treated by DOS partly as ordinary files and partly as directories. We noticed that although our programs ought to be able to read subdirectories just as they can read other files, they in fact cannot. Although this discovery is an interesting technical detail, it is of little practical value. In the next few columns, we'll cover some of the more practical issues concerning subdirectories.

What Are Subdirectories?

What do you do with subdirectories and why do you use them? Although we can use them with diskettes, subdirectories are really intended for large-capacity Winchester disks, such as the IBM 10-megabyte fixed-disk unit that is part of the PC-XT. The main purpose of subdirectories is to help us deal with the large number of files that can fit on a hard disk. When you store hundreds of files on one disk, keeping track of them can become an extremely complicated task.

Subdirectories let us organize our files into reasonably sized groups. For example, my PC-XT has about 794 files on it at the moment. If all those files appeared in any one DIR directory listing, I'd have a difficult time finding what I want. So, like most hard-disk users, I have my files grouped into subdirectories, about 24 of them.

Peter Norton

Trying to figure out the best way to use subdirectories isn't easy. None of the several schemes I've tried is completely satisfying, and I now use a hodge-podge of half-baked approaches, which are very loosely organized. The confusion that I have experienced using subdirectories on a hard disk is fairly typical, I believe. So I will explain what I have learned about managing a Winchester disk.

The first thing that I learned was to make a distinction between command paths and current directories, which are very often confused. In fact, this distinction turns out to be the technical crux of the matter, which determines what we can and can't accomplish when we try to use subdirectories. So, before we get to the pragmatic advantages of subdirectories, we'd better get a clear idea of what is going on with command paths and current directories.

In the old, simpler days of DOS 1.0, we were logged onto a disk drive; it was our default drive, and we knew where we were because DOS always told us with the command prompt:

```
A> or B>
```

The prompt told us that our default drive was A (or B), and we knew where we stood.

If we gave DOS a command such as FORMAT, it would try to find on the default drive the program that carried out that command. Likewise, when any of our programs used any data files, or worked with a diskette drive, they always either picked up things from the default drive or explicitly referred to another drive (for example, B:DATAFILE). But these were the simple old days. In the world of DOS 2.0 and 2.10, things are considerably more complex.

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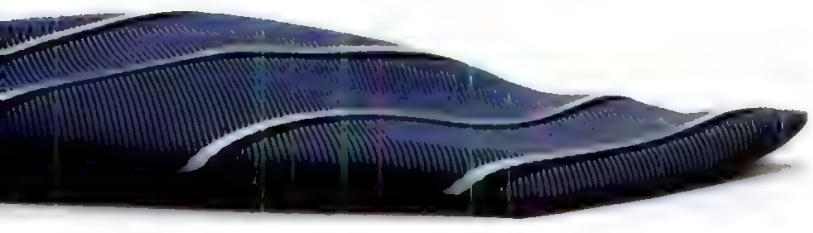

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CIRCLE 833 ON READER SERVICE CARD

First, there is the current directory to consider. Since the disk at each drive letter can have several directories on it, DOS keeps track of a current directory for each drive. The current directory, for any drive, is where DOS will look for anything on that drive. Unless we tell DOS otherwise, by specifying a path name, DOS will look only for a file within a drive's current directory. If we want to locate a file that is lurking in another directory, DOS won't see it.

One of the things that surprises many people about current directories is that DOS maintains one for each drive. If we have, say for example, two disk drives, a Winchester hard disk, and a RAM drive—for a total of four different disk drives—then DOS will record a current directory for each one of them. Each current directory can be set separately, and each has nothing to do with the setting of the other ones.

DOS's ability to record separate directories is not dependent on which disk drive is the current one. Here's a typical example that you'll encounter on an XT or a PC with an expansion unit: Normally our default drive is the hard disk, drive C. Perhaps we have a subdirectory set up for *WordStar* or *MultiPlan*, so our current directory might be:

```
C:\WORDSTAR
```

Now, suppose we want to check the programs on an interesting diskette that someone hands us. Placing the diskette in drive A, we change the default drive to A so that DOS will now be looking at the A drive. But DOS remembers that the default directory for C is \WORDSTAR. If we play with the diskette for a while, and then decide to copy it to our hard disk, we might do it like this:

```
COPY A:*.*C:
```

But, in this case, the current directory for C is still \WORDSTAR, so that's where the diskette files will be copied. Chances are, we might have meant to copy them to some other directory; but, unless we so informed DOS, it will pick up our current directory for the drive.

Let me repeat: Whenever we ask for a file or a directory listing from any drive, what we get is always taken from the current directory on that drive. Unless, of course, we ask DOS to use another directory by telling it the directory path.

Subdirectories enable us to perform a juggling act that puts programs and data files into the right directories.

Practical Consequences

This default feature has lots of practical consequences. For one thing, it means that each subdirectory acts in some ways like a separate diskette. Many programs, such as word processors, are prepared to have us tell them what drive to work with; then we in turn tell them which files to use on that drive. They may also give us a list of files on that drive. Most such programs, written long before DOS 2.0 introduced subdirectories and paths to microcomputers, won't let us give them path names and aren't prepared to change the current directory for us. Although some newer programs do include these features, most existing programs do not.

What this boils down to is that when we're using word processors or similar programs, the current directories on our disks set the limits that the programs must work within. Since these programs can't see beyond the confines of the current directories, the current directories act very much like separate, independent diskettes: If what you need isn't on the current directory, you can't get to it, until you leave the program and return to the DOS command level. Once you are there, you can change the current directory with DOS's CHDIR command and start up the program again.

This restriction applies only to programs that aren't written to accommodate subdirectories and the other special facilities of the DOS 2 series (DOS 2.x). Unfortunately, for some time to come, these programs will constitute the majority of those in current use. And even when we do see plenty of programs that fully support subdirectories, there will still be an important handful of programs that we use every day that do not. As a practical result, the full benefit of subdirectories will elude us much of the time.

You may wonder what I am getting at when I talk about not getting the full benefits of subdirectories. Subdirectories enable us to perform a juggling act that puts programs and data files into the right directories. And when we exert the appropriate degree of effort, we'll achieve the right results. But before we can begin to get into the details of using subdirectories, we have to take a look at command paths.

We'll have to leave that to the next issue of this column. But, before we close, here's a small practical tip. To help you keep track of where you are now—that is, to be reminded of the current directory on the default drive—you can use the DOS 2.0 PROMPT command. Normally, when DOS gives us its command prompt, it just tells us the default drive, like this:

```
C>
```

But, if we enter this PROMPT command,

```
PROMPT $P$G
```

then DOS will give us a command prompt like this:

```
C:\WORDSTAR>
```

If you want to use this handy feature, remember that it only works with DOS 2.x. Because you only have to do it once, you might want to include it in your AUTOEXEC.BAT file. ■

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The PC Goes For The Gold

The 1984 Summer Olympics in Los Angeles will bring together the world's finest amateur athletes. But they'll be helped by a real pro—the IBM PC.

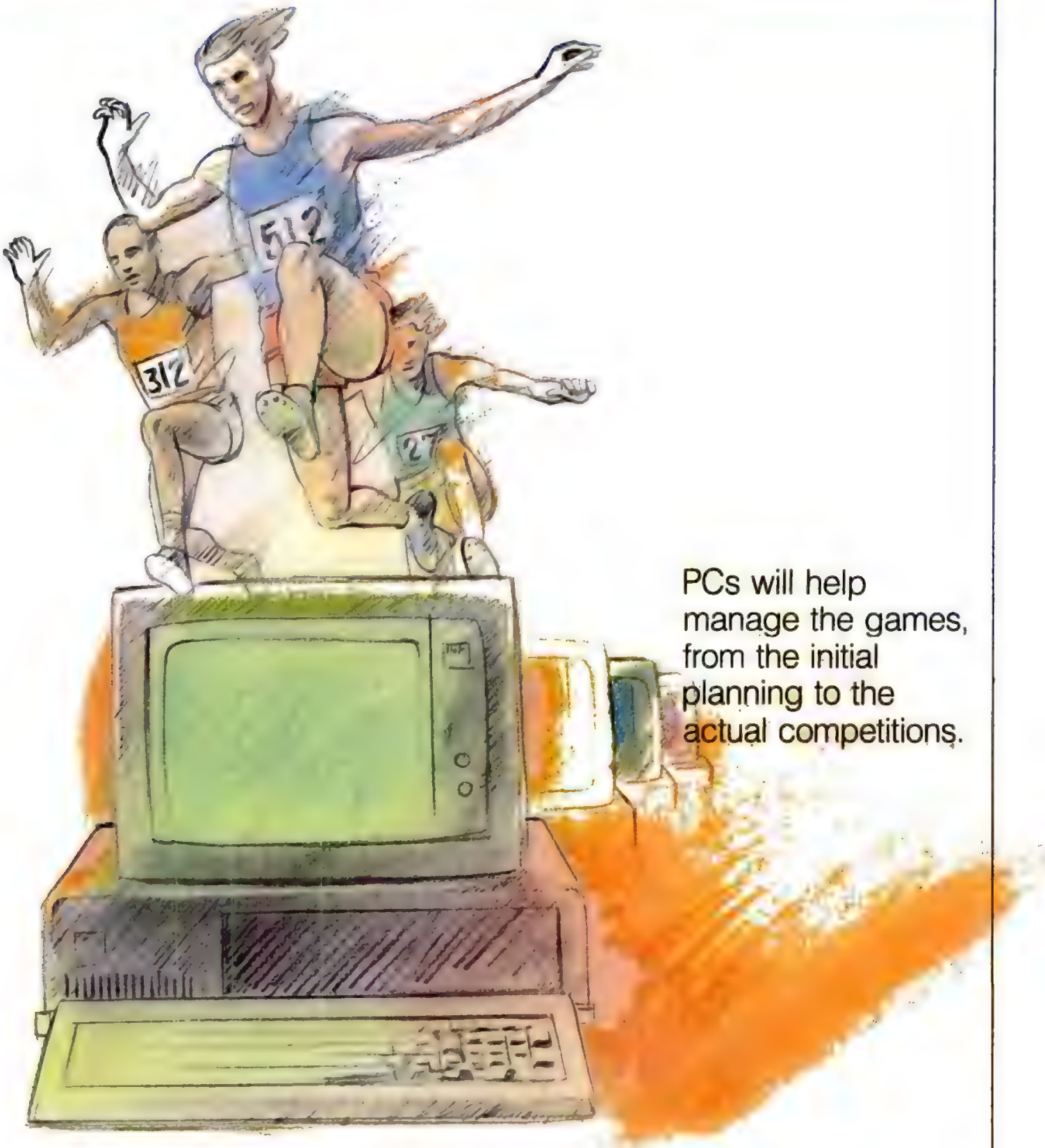
Illustrations: Ivan Powell

At the 1984 Summer Olympics, just a few months away, a world-class multisystem computer hookup will coordinate the world-class athletic competitions, and its main performer, the IBM PC, is due to earn several medals. Although invisible to television viewers and the fans in attendance at the games, an unprecedented electronic network supporting all facets of the 16-day sports festival will be hard at work behind the scenes.

The gigantic multisystem hookup is being created by the Los Angeles Olympic Organizing Committee (LAOOC) to bring a full range of services to the more than 10,000 athletes, 4,000 National Olympic Committee officials, 8,000 media representatives, and untold thousands of spectators who will pour into Los Angeles between July 28 and August 12 this year. A major component in the hookup is the IBM PC, courtesy of IBM Corporation, one of the 30 official Olympic sponsors.

The PC became a member of the Olympic team about a year and a half ago, at which time IBM fulfilled part of its sponsorship agreement by donating 100 PCs, 100 Displaywriters, two System 38s, a few other assorted computers, and the services of Jerold Kotler, advisory systems engineer.

The first thing Kotler did on arrival at the LAOOC offices was to "call up IBM and find out where the PCs were." He then interviewed members of major departments to find out what kind of work they had, whether they needed a PC or a Displaywriter, and what type of software would best suit their needs. Kotler wanted to know who would need a spreadsheet application, whether a department's coor-



PCs will help manage the games, from the initial planning to the actual competitions.

dination requirements could be met by a database package; whether the best course would be to develop specialized programs from scratch, and so on.

In Training

When the interviewing and initial parceling-out of PCs was complete, Kotler introduced the new computer users to the spreadsheet program *Multiplan* in order to get their fingers on the keys as soon as possible.

"I'd say 80 percent of the people had no prior experience with personal computers," Kotler said. The training on *Multiplan*, he surmised, would demonstrate an application closest to the planners' needs. His strategy was first to get them hooked on using the machines, and then to answer questions on theory. Only after the initial spreadsheet training classes were over did the staff begin training sessions on operating system concepts and more general procedures for using a personal computer, such as formatting and copying disks or using utilities.

At first "I was trying to light fires all over," Kotler said. He moved from department to department to make sure people were using the PCs and to help individuals with programs. But the PC's usefulness soon became apparent, and Kotler and his colleague, data processing manager Jackie Henderson were able to distribute PCs throughout the LAOOC building as different groups vied for their share of the available equipment.

By the end of the early training phase, as many as 65 of the 100 donated PCs were in use to help manage the games, from the initial planning right down to the actual competitions. The vast majority of the planning work was and is still being done with *Multiplan*, with some forays into *VisiCalc* and Lotus' *1-2-3*. For database needs, *dBASE II* and *pfs:FILE* are called upon. Most word processing takes place on the Displaywriters although *Personal Editor*, *EasyWriter*, and *WordStar* are also used.

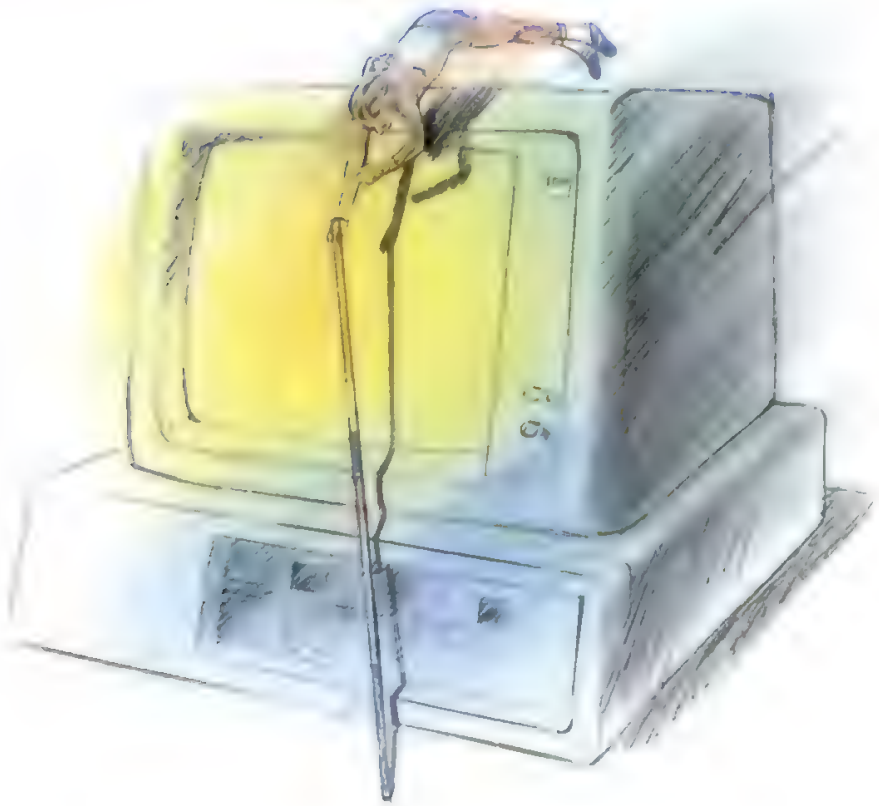
The PC's first real contribution—using custom-made software—was the quantification and organization of the mountains of data taken from a questionnaire sent to the National Olympic Committees (NOCs) around the world. Designed to help allocate housing space and resources, the forms sought answers to questions about how many men would be arriving, how many women, and how many officials. The questionnaire also helped the planning committee determine how many pencils, desks, special diets, telephones, and copy machines would be needed by the various contingents.

"We needed some estimates," Henderson said. "The PCs were used to determine what the needs are going to be, so that the manufacturers, such as Levi Strauss, can start manufacturing."

The PCs were also instrumental in planning—but not administrating—the distribution of tickets through Sears department stores and various banks, the ticket-pricing policy, the seating at sports facilities and the inventorying of the tickets (there will be more than eight million tickets available for these games, the most in Olympic history). The computers were also used to help allocate the hotel rooms—more than 20,000 in nearly 100 hotels throughout the Los Angeles area.

The PCs have—and continue to be—involved in public relations activities for the Olympics. In a torch relay sponsored by AT&T, the PC will maintain the spreadsheet program that plots the route of torch relay runners though all the nation's state capitals. The computers will multiply distances in kilometers between each city times the expected running rates to project expected arrival times. In another instance, the ubiquitous *Multiplan* was used in Levi Strauss' Children's Art Project, in which some 300,000 children contributed over 70,000 pieces of art. The art will be combined into "welcome collages" to be posted in L.A. airports. The spreadsheet program counted the number of pieces sent and helped award prizes based on the percentage of participation at each school.

PCs will be at the front lines for accreditation and security when the delegations begin filing in.



The PCs will actually print out badges and reports to help guard the games.

The finance department took to the PCs immediately, using them for budgeting, purchase orders, and accounting. A PC transmits data to the general ledger program via timesharing, entering data directly as well as in offline mode. An investment portfolio system developed for the PC manages all the money that comes in from donations.

PCs at the Front

PCs will be at the front lines for accreditation and security when the delegations of athletes and officials begin filing in. For the 1983 trial events in such sports as diving, cycling, and water polo, the PCs merely kept track of the lists of people scheduled to arrive and their access rights to specific areas and events.

When the games proper begin in July, the PCs will actually print out badges and reports to help guard the facilities and participants from incidents that might mar the harmony of the proceedings. The data collected from NOC questionnaires and from the press will be fed into the systems. PCs will only dispense lost badges or on-demand badges as a backup for the centralized badge system, which will employ System 38s and Printronix printers to produce color-coded badges complete with bar codes.

Several sports will utilize the PC, including gymnastics, swimming, diving, archery, shooting, fencing, and boxing. The actual interface will vary sport by sport. Some events will have an electronic hookup; others will merely use the PC to print out raw results, which are then taken to the official in charge of reviewing all results that go to the "big board." (Speaking of printing out results, it has been estimated that eight boxcars of paper will be needed to print up scores.)

While PCs will transmit results and may sometimes act as unofficial terminals, the actual number-crunching to calculate scores and rankings will be performed by an IBM mainframe at "McAuto," the automation systems division of McDonnell Douglas. Since the 1984 games are a temporary phenomenon, the organizers didn't think it practical to establish a large independent mainframe facility; major applications that need additional computing power borrow it from sponsoring companies.

Human resources are allocated via PCs and System 38s. Tracking personnel for the Olympics will be a Titantic task; more than 50,000 people will work for the LAOOC in one fashion or another by the second week of August, including the paid staff, volunteers, and members of "citizens' advisory commissions," who help keep the Olympics on schedule.

Each of the LAOOC departments needs to schedule paid and volunteer personnel in the Olympic villages and other Olympic venues. The System 38 operates several scheduling systems, including a personnel tracking system to log the permanent staff, a time-planner to dictate the number of hours required per site, and a game-staffing system for the 16 days of the games.

"We will be using the PC to create our payroll record in order to keep track of paid people during the Olympics," Henderson said. "People will still have to sign in and out, but that will be in the back end of the PC to be uploaded to a payroll system." The payroll system will also be hooked into the accreditation system.

Networking

Probably the highest achievement of the LAOOC's technology department, which is overseeing the computer and communication systems, will be the establishment of interfaces between the differ-

ent computer systems and information services. Should all go according to plan, there need never be a reason for an urgent message to go undelivered or for a reporter to miss the results of an important event.

The first portion of this network is the audio distribution system (ADS) for phone communications. Donated by IBM, this central communications system records and digitizes phone messages and saves them so that anyone with an authorized password code can call in and get his or her messages. Jim Murray, director of the LAOOC technology department, was responsible for the installation of the audio distribution system. "The system is geared so that if you don't pick up your messages, it will call you every 2 hours. If people get a call on ADS, they'll be forced to learn how to use it, or else they can't get their messages," he smiled.

Reporters will be able to receive incoming telexes in their electronic mailboxes.

The international version of ADS was installed first, allowing callers to leave or receive messages in English, French, German, and Italian. However, that system had to be replaced because it was too small—it could accommodate only 1,200 people, large enough for most major corporations, but not large enough for the Olympics.

Another communications system for the Olympics is the electronic mail network, based on Western Electric's 3B computers. Approximately 2,000 terminals, each with its own printer, will be located at Olympic venues, administrative buildings, and press centers and connected to the central computers. "Anybody can send a message to anyone else on this system," said Murray. "All they need to do is type in their name."

The electronic mail network will also contain profiles of the multitudes of Olympic athletes, along with their biographies, histories, and athletic records. The general public as well as the press will have access to this information.

Screens will come up in both French and English, the two official Olympic languages, said Murray, so the language barrier isn't expected to be much of a problem. For athletes and delegates who don't speak either language, each delegation has an interpreter to guide novices through the "computer relays."

To complete its communications network, the technology department of the LAOOC has worked out an agreement with MCI and Western Union for an interface between its electronic mail system and the international telex network. This means, for instance, that the press working in the stands can go to one of the 2,000 Western Electric terminals, enter stories on the electronic mail system, and transmit them via telex to readers waiting in Europe or the Far East. Reporters will also be able to receive incoming telexes in their electronic mailboxes. Results of Olympic events can be downloaded from the IBM mainframe onto this system for quick transmission.

A final (software) connection in the communications network is planned between the audio distribution system and the Olympic paging computer, which links personnel in the field via a beeper system. The beepers do more than beep a warning to call a certain number; they actually print out their messages on a liquid crystal display! With so many systems operating simultaneously—ADS, electronic mail, international telex, Olympic paging, and the computerized reporting of results—there are a lot of possibilities for foulups, admitted Murray. Nevertheless, he's confident that the interlocking web will serve well.

"I enjoy technology," said Murray, "and I also think it's going to be a lot easier for us to operate in 1984. We'd just be killed if we didn't have good communications, and Los Angeles is a big town. There's a lot of people to communicate with." And a lot of computing power to do the communicating, he might have added. The Olympics may be open only to amateurs, but with the PC lending support to the games, there's nothing amateur about the computer Olympic that is backing up the main events. ■

A Word on our Sponsors

Sponsors of the summer games, IBM included, are shouldering Olympic-sized expenses.

The right to call oneself a sponsor of the 1984 Olympic games does not come cheap. Using the Stars in Motion logo next to one's corporate emblem, as sponsors like IBM are entitled to do, is a privilege, a business right jealously guarded by the Los Angeles Olympic Organizing Committee (LAOOC).

"We protect it viciously," said John Bevilaqua, director of corporate relations for the LAOOC. "These people have paid a lot of money for exclusive use [of the Olympic logo]."

The sale of Olympic sponsorships to the highest bidder was entirely according to plan. As part of its compact with the city of Los Angeles, the LAOOC pledged that no public money (local, state, or federal) would be used to pay any of the costs of the Olympics. Instead, the money to put on this gigantic sports event was slated to come from three areas of sales: television rights, tickets to the actual events, and corporate sponsorships. The money raised will enable the committee to put on a first-class show even as it spares the taxpayer from footing any of the bills. If sales are high enough, they may even allow the LAOOC to reach its secondary goal—the creation of a surplus of from $450 million to $500 million.

There are three levels of "commitment" to the 1984 Olympics. The least expensive is that of licensee, which qualifies companies to sell products carrying the Stars in Motion logo. This is the realm of the keychain and the souvenir pen. Firms pay a standard fee equivalent to a set percentage of the forecast sales for their product. Bevilaqua wouldn't specify any particular fee, though he said 10 percent was standard. For instance, if a company stood to make $2.5 million off the sales of keyrings with the logo, the Olympic Organizing Committee would get $250,000.

The next step up is that of Olympic supplier. Companies in this category provide services and material goods needed for the games—footballs and handballs from Adidas, wrestling mats from H.G.B. Backstrand, solid waste management from Waste Management, Inc. Those who don't donate services or goods send cash. Suppliers are permitted a restricted use of the Olympic's logo, which costs them $500,000 to $1 million.

> By the end of the early training phase, as many as 65 of the 100 donated PCs were in use.

The most prestigious and most costly is the title of 1984 Olympic Sponsor. The LAOOC wanted this group to include the "cream of corporate America," said Bevilaqua. When the last Olympic games were staged, he said, there were too many sponsors, with the result that the status and significance of sponsorship were diminished and trivalized. Moreover, the practice brought in little revenue, only $10 to $11 million. "We have sponsors now who give that much in cash," Bevilaqua said.

Coca-Cola, "official" manufacturer of fruit juices, ades, and drinks, was the first Olympic sponsor. To become a sponsor costs anywhere from $4 million to $15 million with $10 million an average fee. Sponsors can couple the Olympic insignia with their own on their products and are also the only group that can call themselves "official." "We're trying to cut down on that word," said Bevilaqua.

As part of its agreement with the LAOOC, IBM donated assorted equipment and other computer-related items, such as training for Olympic personnel (see the accompanying article). Bevilaqua also said there is the possibility of an "Olympic PC," a PC with the Stars in Motion emblazoned on its side, but that is still under discussion.

Support for the Olympics through sponsorship has proved surprisingly lucrative. Sponsors have brought in approximately $120 million; an additional $10 million to $15 million is pouring in from the various licensed products. All in all, said Bevilaqua, sales of the logo should provide about one-third of the Olympic income.

"This will have a dramatic effect on the Olympics for years to come," Bevilaqua said of the new financial approach. The 1984 games mark the first time that so little International Olympic Committee or national funding has been necessary to operate the festival. "It probably won't be set up the same way again," he added. For one thing, he noted, there won't be the same mass market for either television rights or tickets at the next game site, Korea. Nevertheless, he predicted that the world will see the Olympics marketed more by the International Olympic Committee. "Our model won't be duplicated, but the change we've precipitated in Olympic marketing will continue on down the line."—V.S.

till maraton
för alla
springa!

Jim Fixx Runs A Program

Fixx has traded in his pencil for a PC and created a program to give joggers a run for their money.

Four years ago, the success of *The Complete Book of Running* by James Fixx helped usher in the running generation and turned its author's legs into the most famous pair since Betty Grable's. At that time Fixx wrote as scribes had been writing for generations—with a well-sharpened pencil.

Fixx still writes about running, but these days he does his writing with *WordStar* on an IBM PC. He has also designed and endorsed a software package for runners called *The Running Program*, which is being produced by MicroEducation Corporation of America (MECA), of Westport, Connecticut.

"I supplied everything having to do with knowledge of running, and they supplied everything having to do with knowledge of computers," said Fixx of his relationship with MECA. Working on the project gave him his first serious exposure to computers. "I guess I had a bias against computers without realizing it. For a novice like me, the computer aspects of the project have been both fascinating and baffling."

Running WordStar

It was the folks at MECA who suggested that he try working with a computer. Fixx followed their advice and purchased

Photograph: Roberto Sandoval

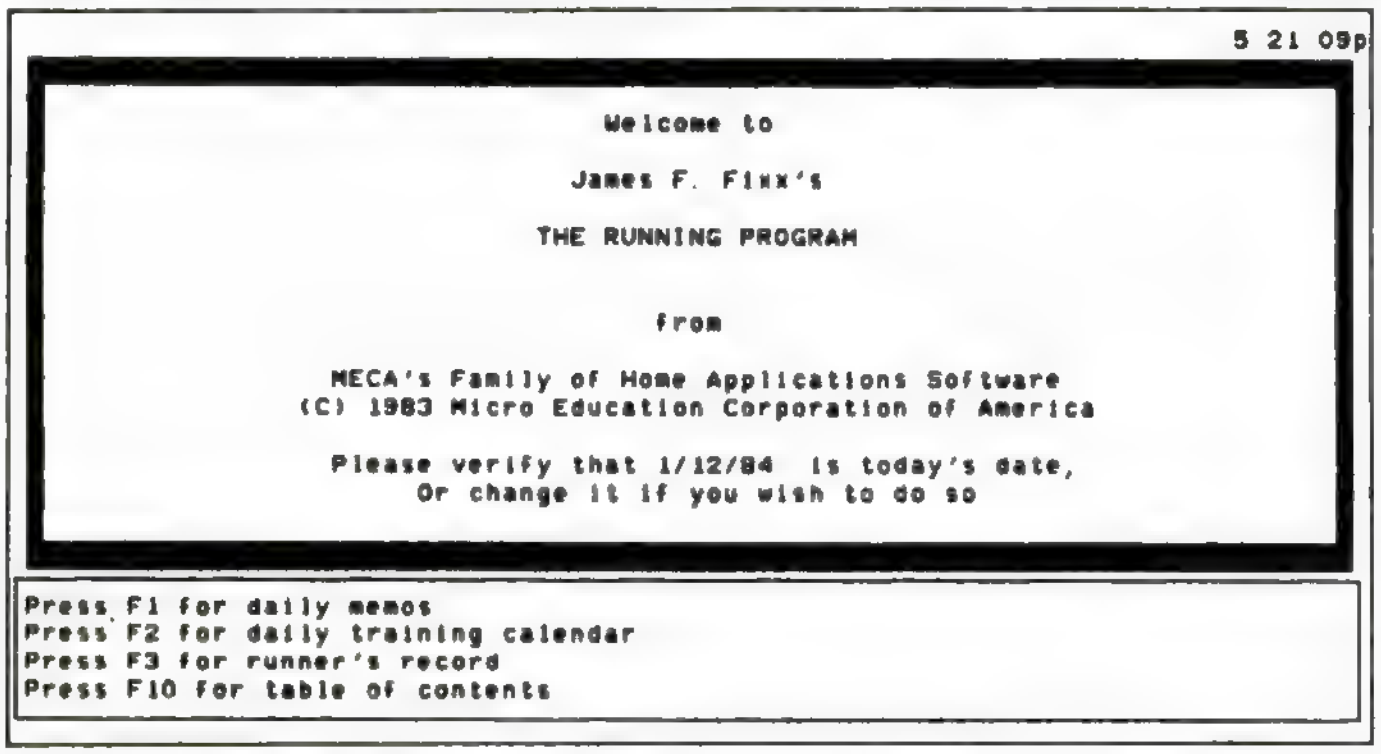
a PC, *WordStar*, *1-2-3*, and a NEC Spinwriter 3550 printer. His finances have since been transferred from a pile of receipt-stuffed shoeboxes to the files of *1-2-3*, but Fixx has few kind words for *WordStar*, which he describes as "the worst, most illogical thing I've ever tackled in my whole life." Despite his complaints, he echoes many writers who hate the program but use it religiously: "I've gotten so used to it. . . "

"*WordStar* could be a whole lot better," he said. "When I mark a section of copy to be moved somewhere else, I hit Ctrl-KV—what does KV mean? It should be something like MC, for Move Copy. The programmer obviously didn't care."

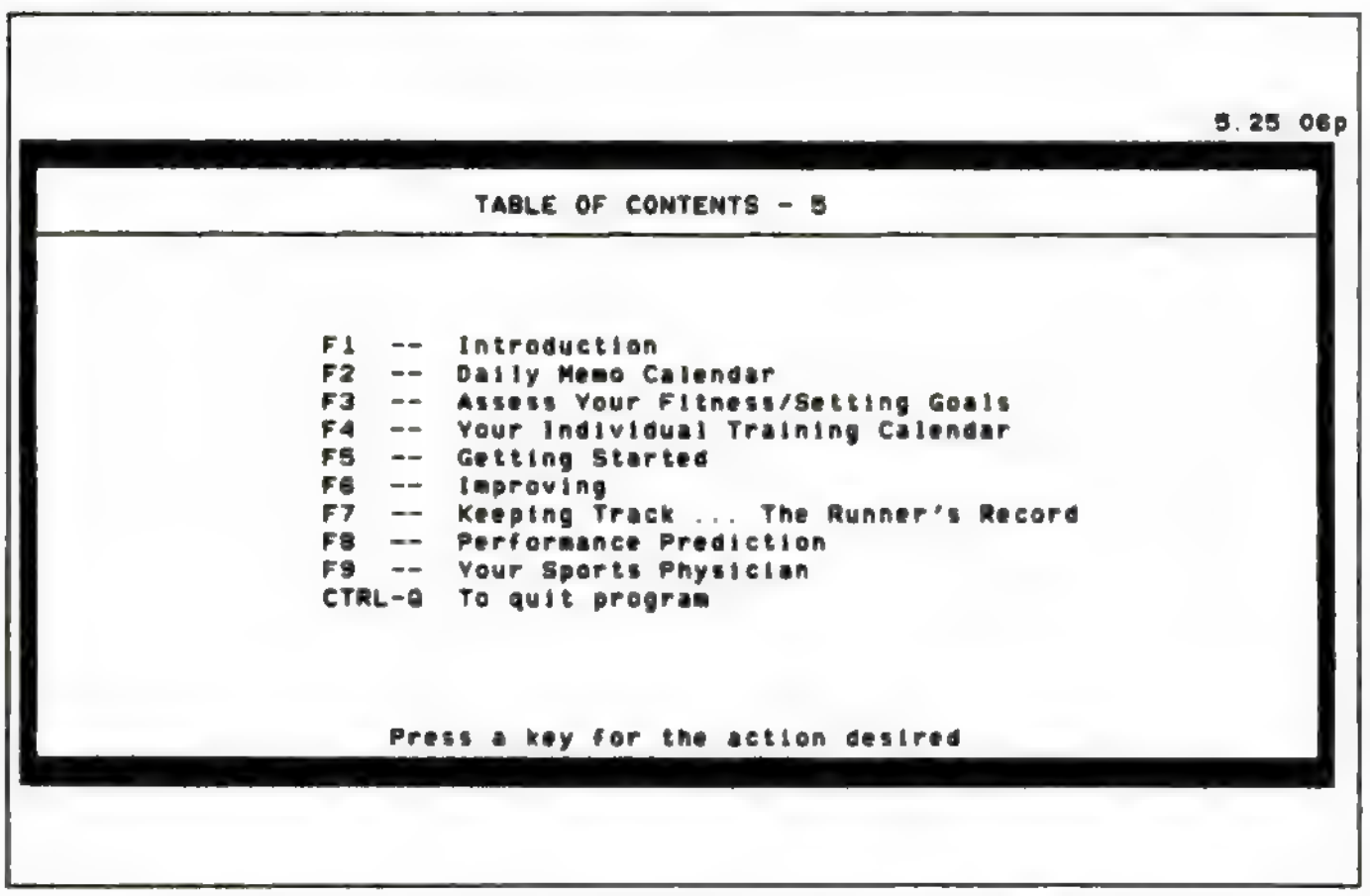
Fixx, who spent years as an editor at *Life*, *Horizon*, and *McCall's* before putting on his first pair of running shoes, is a conscious, self-analytical writer. He hasn't been completely won over by the joys of word processing. "I've done a lot of writing and even more editing, and I don't see any way in which a word processor is going to make you a better writer," he said. "What it does do is make it easier to move things around and to make corrections—that's helpful. However, it also seems to be harmful. I think that there's more of a tendency, when you're using a word processor, to write sloppily because you can do it so fast and make the changes so easily. In the back of your mind is the idea, 'If I don't do it right now, I can catch it on the next go-round and tidy it up.' So I suspect that in the early drafts of writing with a word processor there is more bad writing than there would be if you were writing with a pencil.

"Writing with a pencil, because it's so hard and slow, forces you to think about the words you are going to put down. For instance, you might ask yourself the question 'Do I really have to use the word *very* to modify the word *big?*' And then you realize that *very* does not add to the sentence. Word processors are so easy to work with that they let you write to excess, at least in the early stages."

Most writers find that, if nothing else, word processing at least speeds up the writing process. Fixx disagreed. "I've always noticed that if I write a first draft



The *Running Program*'s introductory screen lets you go right to the section you want to use, or stop off at the table of contents.



The menu-driven program uses the function keys to access its different sections.

> Fixx spent years as an editor before putting on his first pair of running shoes.

slowly with a pencil, as I still occasionally do on airplanes, then I do relatively little reworking. I think there's a distinct amount of time that I have to put into a given piece of writing to get it the way I want it. I either put it in in the beginning when I work with a pencil, or I write fast on the word processor, and then I have to do a lot more polishing."

Serious Software

Jim Fixx may not be in love with his word processor, but he thinks that *The Running Program* will be useful to serious runners. The product, which sells for

$79.95, includes both a daily memo calendar and a training calendar, a questionnaire and series of exercises to assess your fitness level, hints for getting started and improving your sprint, a troubleshooting chart for aches and pains, a diet program, and a calculator to help you predict your race performance. For those inclined to get up from their computer monitors long enough to slap on a pair of Nikes, it should prove a valuable workout and exercise tool. "It was not designed as a one-time amusement," Fixx explained, "but as something that people will go back to."

The software exclusively uses the PC's function keys. The company boasts that *The Running Program* is so simple to learn and use that there's no need for documentation—which seems ironic considering that Fixx is as dedicated to words as he is to his daily 10-mile run.

Fixx doesn't resort to his pencils anymore, except when he's on the road. He claimed, however, that he could live without his computer. "If they came and took it away from me," he said, "I would go back very easily. No problem." But the idea of spending next summer without the electronic insert and delete has him planning a portable substitute for his PC.

"I think this computer I have here is a little cumbersome to throw into the back of my station wagon and take away on the vacation I'll be taking in July and August," he said. "But I'd love to have a PC*jr* to hook up to my TV set and do some writing while I'm away." ■

Software For Jocks

This program, aimed at joggers on all levels, specializes in compiling and analyzing running statistics, then turning them into graphs.

For a conspicuously sedentary bunch, software designers seem enthralled with producing software for runners. One such program is the *Computer Running Log* from Homesoft, which enables the recreational or hard-core jogger to create a database of his running history and then selectively analyze and graph that information.

Apparently running statistics are of as much long-term interest to some people as bank statements are to others. The *Computer Running Log* would be of little interest to anyone who takes exercise only in stride. The running log requires a dedication to recordkeeping, speed, and endurance. The manufacturer has tested it successfully with the IBM PC as well as with the compatible Compaq and Columbia machines.

To get started you must first format a program disk with DOS, load it with BASICA and format a data disk. Even though the product can function with only one drive, two drives are clearly more convenient. Otherwise, working with the *Computer Running Log* is child's play; all input sections can be accessed via no more than seven numbers. A *Running Log* calendar can be created for any period until 1995 with up to two daily inputs for a main (workout) and secondary (race) run. The *Running Log* takes the information one step further by computing your average pace for each run as soon as it is entered so you can immediately judge how well you did that day.

As your database builds over the weeks or years of working out, the *Log* can begin to do its serious analytical duties. It can select daily running information between any two dates in the calendar, compute weekly, monthly, or yearly total miles, and can do all these calculations for either workouts or races. For those eager to see numbers translate to lines on a graph, the program will chart miles and average pace for any of the selected information on either the monitor or a 60-column printer.

The *Computer Running Log*'s documentation, though comprehensive and readable, is little more than an offset copy set in dot matrix type, making it difficult to read. Information about running training and about how logging information can actually help your running are conspicuously absent and the graphs and calendars could have been brightened with color graphics.

However, for men and women to whom running is more than recreation and for serious racers who feel compelled to chart their development over a lengthy training cycle, the *Computer Running Log* could prove valuable or at the very least interesting.

Just try not to sweat on the keyboard, will you? —**M.P.**

Computer Running Log
Homesoft
P.O. Box 6254
Salt Lake City, UT 84106
(801) 534-5604
List Price: $39.95
Requires: 48K RAM, 1 disk drive, DOS 1.1. 80-column printer optional.

CIRCLE 709 ON READER SERVICE CARD

COVER STORY/MARILYN SCHORIN

Programs For A Healthy Practice

Diet and exercise analysis software enhances the health-care professional's services and saves time and money.

Health-care professionals can no longer routinely dispense such off-the-cuff prescriptions as "lose weight," "eat a balanced diet," or "you need more iron." Clients want detailed diet analysis. They want to know the specific strengths and weaknesses of their present diets, and they want suggestions on how to tailor a program to their individual needs.

Now, with dietary and exercise analysis programs for the PC, the health professional can provide this service with a minimal investment of time and money, or the individual can use these programs at home.

The seven programs reviewed here are designed for home or professional users. With notable exceptions, they work in basically the same way. You keep a record of all foods consumed for a period of time. To cut down on arbitrary choices you indicate how detailed the record should be. For instance, the entry "soup" is too vague; you must specify "chicken noodle soup." The more precisely foods are documented, the more accurate the analysis.

Using the food diary, which is included in most programs in the form of a database, you code the foods and enter the codes and amounts eaten. The nutrient content of each record and the food intake for a particular day is compared with the U.S. Recommended Dietary Allowances (RDA). Since many users want to keep a copy of the analysis, all programs allow you to make a printout.

The selection of nutrients in the analy-

Illustration: Teresa Fasolino

sis varies, but the following items form the core of almost every program: calories (food energy), protein, carbohydrate, fat, vitamin C (ascorbic acid), calcium, phosphorus, iron, potassium, vitamin A, thiamine, riboflavin, and niacin.

Although all the programs reviewed here follow this general approach, each is radically different. The sidebar "Selecting Diet Software" gives you a basic idea of what's available. Features range from exercise programs to shopping lists.

Evrydiet for Everyone?

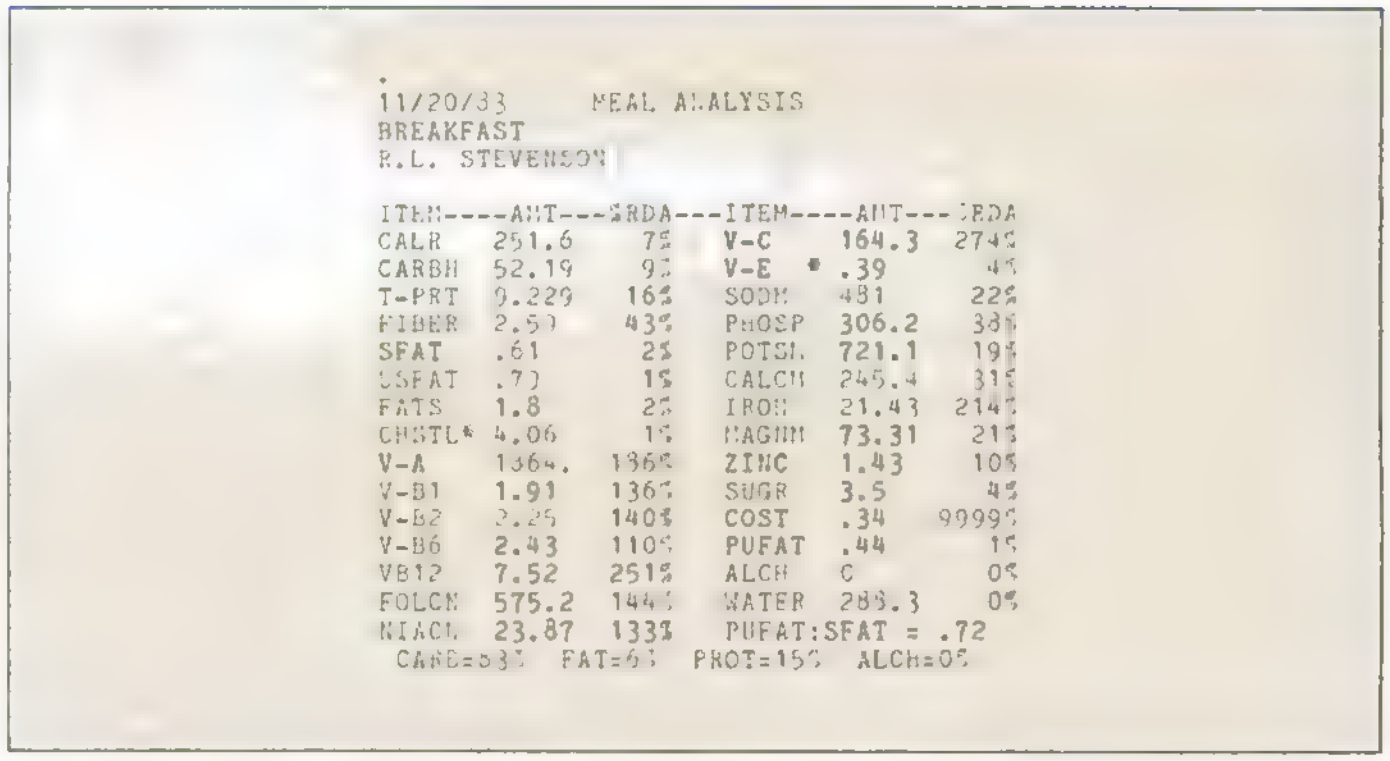
One of the best programs available is *Evrydiet*. It can analyze one day's consumption or only a single food and stores the report by user name and date. A disk can hold records for 22 people for 60 days or records for 660 people for 2 days.

Entering the foods into *Evrydiet* can become a somewhat tedious process. First, you determine in which of the 20 odd categories the food is listed; then, within that category, you make your choice among 60 or so food items and enter the appropriate number. Repeating this process for each food on a 25-food record took 20 to 25 minutes.

I didn't find the database that useful. Although most of the foods I looked for were on the list, it offered such a variety of foods that it was often confusing.

Nutritional expertise is required for menu planning, but the program makes no attempt to assess whether the client is eating too much or too little. It simply sets up calorie guidelines for a requested weight gain or loss. *Evrydiet* will calculate the daily calorie limit to achieve the stated goal regardless of how much someone can gain or lose safely. Other special diet requirements, such as carbohydrate or cholesterol restriction, are beyond this program's scope, but it does note deficiencies or excesses in the current food record.

Even though the foods I entered might be found in any typical well-balanced diet, the program indicated incomplete values for 15 nutrients. Only three nutrients, vitamin C, phosphorus, and iron, were included from the core list. The other twelve nutrients given are useful in counseling, but are irrelevant unless they are analyzed for the entire food list. Nonetheless, *Evrydiet* is one of the few programs that informs you when its analysis is incomplete; each incomplete total in the report is marked by an asterisk.



```
11/20/83      MEAL ANALYSIS
BREAKFAST
R.L. STEVENSON

ITEM----AMT---%RDA---ITEM----AMT---%RDA
CALR    251.6     7%   V-C     164.3  274%
CARBH   52.19     9%   V-E   * .39      4%
T-PRT   9.229    16%   SODM    481      22%
FIBER   2.59     43%   PHOSP   306.2    38%
SFAT    .61       2%   POTSM   721.1    19%
USFAT   .79       1%   CALCM   245.4    31%
FATS    1.8       2%   IRON    21.43   214%
CHOLS*  4.06      1%   MAGNM   73.31    21%
V-A     1364.   136%   ZINC    1.43     10%
V-B1    1.91    136%   SUGR    3.5       4%
V-B2    2.25    140%   COST    .34    9999%
V-B6    2.43    110%   PUFAT   .44       1%
VB12    7.52    251%   ALCH    0         0%
FOLCN   575.2   144%   WATER   283.3     0%
NIACN   23.87   133%    PUFAT:SFAT = .72
 CARB=53%  FAT=6%  PROT=15%  ALCH=0%
```

Figure 1: *Meal analysis by* Healthaide.

Evrydiet responds to your mistakes with a bell and a helpful message (for example, "I am looking for a (code) number between 1 and 60.") You're not left to figure out if it is working or just waiting for additional input. This on-screen help system lets you use the program without turning constantly to the manual.

Evrydiet contained a number of typographical errors. In fact, cholesterol data is inaccurately reported in grams rather than milligrams. Despite this drawback, *Evrydiet* is easy to use both at home and in health-care practices.

Healthaide's Special Features

By far the most versatile program I reviewed is *Healthaide*, by Knossos, Inc. In addition to providing nutrient analyses of diets, *Healthaide* can sort the diet on increasing quantities of a particular nutrient. It can also sort the entire database, if you like. Vegetarians will appreciate its ability to look at amino acid content of meals, instead of just the total protein. For exercise physiologists and dietitians, the program calculates basal metabolic rate (by a well-respected formula) and calories burned in various types of exercise.

The basic features are identical to the other programs—dietary analysis based upon a meal or a set number of days (see Figure 1). Client information is entered once, and the computer recalls this data each time the program is run. The 700-food database lists foods consumed mostly in California, but the manufacturer promises updates, and the program allows you to create customized databases. Report summaries that contain incomplete data will alert you to the missing values, both onscreen and in the printout. You can also opt for a food-by-food breakdown of the diet to determine which foods are contributing to the faulty totals.

Some features, such as the shopping guide and the obligatory documentation of physical activity are probably useless to most health-care practitioners or home users who want to provide a service in a time-efficient manner. Exercise professionals may appreciate the wide variety of sports included in the exercise section which, for example, allow you to calculate the energy spent running at a given speed. But, contrary to expectation, finding out how many minutes a client spends in each of 26 or more activities can become arbitrary rather than precise. For most of us, it is difficult enough to partition the day's

```
                                NUTRITIONIST                              DIET #0
                                                                          2327GMS
NUTRIENT            TYPE:  14  FEMALE-23 TO 50 YEARS

CALORIES       ]=================================================          148%
PROTEIN        ]=================================================          257%
CALCIUM        ]=================================================          180%
PHOSPHORUS     ]=================================================          236%
IRON           ]=================================================          130%
VITAMIN A      ]=================================================          154%
THIAMIN        ]=================================================          129%
RIBOFLAVIN     ]=================================================          164%
NIACIN         ]=================================================          129%
VITAMIN C      ]=================================================          233%
               ^0        ^20       ^40       ^60       ^80       ^100

CHOLESTEROL     371.5M  POTASSIUM  3269.7M  FAT       138.2G  OLEIC FA      42.1G
CARBOHYDRATE    341.4G  SODIUM     2027.0M  SAT FAT    64.3G  LINOLEIC FA   15.5G

ITEMS:   370 278  57  50  21 490 138 671 628 223 235 693 538   3 165 671 628 514
 112  76 415 693  41 190


          <A>DD  <D>ELETE  <L>IST  <M>ENU  <V>ALUES  <C>OMPONENTS

                    SORT ON CHOLESTEROL   DIET #0:  24 FOODS

  NO. ITEM#              FOOD NAME                 PORTION     SERVING    AMOUNT

   1   165   GROUND BEEF-BROILED-LEAN W/ 21% FAT  2.9 OZ       200%     158 M
   2   3     CHEDDAR CHEESE-CUT PIECES            1 OZ         200%      56 M
   3   76    REGULAR ICE CREAM-11% FAT-HARDENED   1 CUP        100%      53 M
   4   21    SWISS CHEESE                         1 OZ         150%      42 M
   5   190   LUNCHEON MEAT-BOILED HAM             1 SLICE      200%      36 M
   6   112   LARD                                 1 TBSP       100%      12 M
   7   138   MAYONNAISE                           1 TBSP       100%      10 M
   8   57    NONFAT MILK-NO MILK SOLIDS ADDED     1 CUP         50%       3 M
   9   50    FLUID WHOLE MILK-3.3 % FAT           1 CUP          6%       2 M
  10   514   BEANS-CANNED-S/L-RED KIDNEY          1 CUP         75%       0 M
  11   693   COLA TYPE                            12 FL OZ     100%       0 M
  12   628   LETTUCE-RAW-CRISPHEAD(ICEBERG)-CHOP  1 CUP          25%       0 M
  13   671   TOMATOES-RAW                         1 TOMATO      75%       0 M
  14   538   CANDY-CHOCOLATE-MILK-PLAIN           1 OZ         100%       0 M
  15   223   APPLES-RAW-UNPEELED-WITHOUT CORES    1 APPLE      100%       0 M
  16   628   LETTUCE-RAW-CRISPHEAD(ICEBERG)-CHOP  1 CUP          25%       0 M
  17   671   TOMATOES-RAW                         1 TOMATO      25%       0 M
  18   41    IMITATION POWDERED CREAMER           1 TBSP       300%       0 M
  19   490   ROLLS-ENRICHED-HARD                  1 ROLL       100%       0 M
  20   415   CHOCOLATE CHIP COOKIES-COMMERCIAL    4 COOKIES    100%       0 M
  21   693   COLA TYPE                            12 FL OZ     100%       0 M
  22   235   BANANA-WITHOUT PEEL                  1 BANANA     100%       0 M
  23   278   ORANGE JUICE-FROM FROZEN             1 CUP         75%       0 M
  24   370   BRAN FLAKES W/ RAISINS-SUGAR/SALT    1 CUP        100%       0 M
```

Figure 2: *Dietary analysis by* Nutritionist, *including a sort on cholesterol.*

```
History:start                    Active Day                    History:end
14 November 1982                 13 November 1983              13 November 1983

        November 1983                    December 1983
  S     M     T     W    Th     F     S     S     M     T     W    Th     F     S
                                                                    1     2     3
  0     0     1     2     3     4     5     0     0     0     0     1     2     3
  6     7     8     9    10    11    12     4     5     6     7     8     9    10
 13    14    15    16    17    18    19    11    12    13    14    15    16    17
 20    21    22    23    24    25    26    18    19    20    21    22    23    24
 27    28    29    30     0     0     0    25    26    27    28    29    30    31
  0     0     0     0     0     0     0     0     0     0     0     0     0     0

:       Use the keypad  (  PgUp PgDn ) to highlight the desired day.       :
:F1 Diet                        F2 Exercise                    F3 Weight:
:F4 Plot                        F5 Daily Summary               F9 Exit   :
```

Figure 3: *Daily dietary and exercise analysis by* Inshape.

activities into light, medium or heavy, categories, let alone to decide how much time was spent walking 3,4,5, or 6 miles per hour. For this purpose, is it really important to distinguish between two similar activities—say, reading a book and working at a desk?

The database sort has tremendous clinical potential. If a client has a low iron intake, the user can readily pick out foods rich in iron. On the other hand, when prescribing a low-fat diet, he can access 20 or 30 foods or recipes with no cholesterol. What *Healthaide* cannot do is select a specific range of nutrient content without sorting the entire food list. This is wasteful since cholesterol, for example, is not found in any plant foods. The range greater than zero and less than 100 milligrams per serving should be highlighted, so that meat, cheese, and fish are sorted. Few clients are willing to substitute tomatoes for tacos.

Healthaide encourages you to learn its food codes by providing a food list in the manual. However, don't use lined or green-striped computer paper, because you'll have difficulty matching the food with the code on the printout. The method for finding the code onscreen is too cumbersome to use.

You cannot customize the headers on the analyses, but *Healthaide* does not announce itself at the top of each report. Health care professionals may want to use their own letterheads, but since the program does not appear to have a default to stop at the end of 40 or 50 lines, fanfold paper may be more appropriate.

Slow but Reliable

If you're looking for a program that does a good job of dietary analysis, but performs it in an unspectacular, if somewhat plodding way, *Nutritionist* is for you. Code numbers are chosen from a 730-food list provided in book format. Since the foods are sorted into ten categories, finding any item on the list is easy. The on-screen prompt, 100%, appears, and you indicate what portion of a partic-

ular food was eaten. Even if you position the cursor under the digit 1 in 100 and type the number 3, it records that you ate 3% rather than 300% of a food portion.

Like the other programs, *Nutritionist* graphs the client's current diet as percent of RDA. It doesn't ask you who the subject is; it assumes she is a 23-to-50-year-old female. Changing the default settings on RDA comparisons necessitates going back and forth among the menus several times.

Sorting a diet according to a particular nutrient is a useful feature of *Nutritionist* (see Figure 2). If you see that your client has eaten too much protein, for example, you can sort the diet on protein and determine which foods are the primary culprits. If you want a wider food choice, using the screen filter program, you can check the entire database for nutrients of certain values. However, it took about 18 minutes to check the database for foods high in sodium. Even when I put the program on an emulated disk drive, it did not speed up.

Another drawback is that the message—Press Any Key to Stop—stays on the screen the entire time. Since it does not flash or change, you may wait and wonder for several minutes whether the entire system has crashed.

Since it has a complete database, *Nutritionist* does not provide a mechanism for reporting missing data. This is adequate for the original 730 foods, but problems arise when you modify the database. If you add a certain food to the database using package-label data, you usually enter only protein, fat, carbohydrate, and calories. *Nutritionist* assumes that the value of other nutrients is zero.

A major drawback of *Nutritionist* is its lack of on-screen help. You are tied to the manual. If you make a mistake, it sounds a bell but simply repeats the command. Help messages would increase the usefulness of *Nutritionist* tremendously.

Nutritionist is not the most versatile program, but it does offer standard dietary analysis of all-American foods. One additional note: The makers of *Nutritionist* are

Product Information

For more information on the products reviewed in this article, contact the manufacturers.

Nutri-Calc
PCD Systems, Inc.
163 Main St.
P.O. Box 277
Penn Yan, NY 14527
(315) 536-7428
List Price: $129 (low-cost student copies available).
Requires: 64K RAM, one disk drive.

CIRCLE 719 ON READER SERVICE CARD

EVRYDIET
Evryware
1950 Cooley Ave.
Suite 6208
Palo Alto, CA 94303
(415) 321-2708
List Price: $59.95
Requires: 96K RAM, one double-sided or two single-sided disk drives.

CIRCLE 718 ON READER SERVICE CARD

Healthaide
Knossos, Inc.
422 Redwood Ave.
Corte Madera, CA 94925
(415) 924-8528
List Price: $79.95
Requires: 128K RAM, two disk drives.

CIRCLE 717 ON READER SERVICE CARD

The Short Report
Nutrition Services Division of Health Development, Inc.
1165 West 3rd Ave.
Columbus, OH 43212
(604) -
List Price: $1,145
Requires: 256K RAM, two disk drives, printer.

CIRCLE 716 ON READER SERVICE CARD

Diet Monitor
Camrass Corporation
P.O. Box 118
Boonton, NJ 07005
(201) 328-8917
List Price: $69
Requires: 64K RAM, two disk drives, printer.

CIRCLE 715 ON READER SERVICE CARD

Inshape
DEG Sortware
11999 Katy Freeway
Ste. 150
Houston, TX 77079
(800) 231-0627
(713) 531-6100
List Price: $95
Requires: 64K RAM (DOS 1.0 or 1.1) with one or two disk drives, 96K (DOS 2.0) with double-sided disk drive.

CIRCLE 714 ON READER SERVICE CARD

Nutritionist
N-Squared Computing
5318 Forest Ridge Rd.
Silverton, OR 97381
(503) 873-5906
List Price: $145 (Update *Nutritionist II* will be $295).
Requires: 64K (DOS 1.1) or 96K (DOS 2.0), one disk drive.

CIRCLE 713 ON READER SERVICE CARD

—*M.S.*

now advertising an enhanced program that will include more nutrients and an expanded exercise program, among other features. The price will be $295.

But Is It Worth the Price?

In order to give as comprehensive a review possible of the wide variety of diet-analysis programs, I reviewed *The Short Report*, a top-of-the-line $1,000 package. The company refused to send a copy of *The Short Report* for review because it is not copy-protected. However, it referred to us to Randi Aaron, a Manhattan nutritionist who uses the program in her practice. According to Aaron, *The Short Report* uses a code-book approach to entering foods. Clients prepare food diaries using forms supplied by the company, which are designed to simplify the coding process. The database contains 5,000 foods, and new items may be added.

Although the program comes with documentation, Aaron reported that she had to telephone the company four times before she got the program to run. One feature she likes is the ability to customize the header on the report, so that the clinic's, not the program's, name appears. Helpful messages alert clients to health problems associated with nutrient deficiencies or excesses found in their records. It provides appropriate food suggestions, which simplifies the job of client education.

Twenty-five different nutrients are listed in the data bank, but no facility for detecting incomplete summaries accompanies the report. As all data is reported on hard-copy, and no individual data is retained on disk. The cost of this program is at least three times greater than that of other programs reviewed, and I question whether it is worth the cost.

Easy Database Access

You'll probably eventually want a dietary analysis package to do more than examine food records and regurgitate their nutrient content. *Nutri-Calc*'s system allows you to estimate the caloric requirements for an individual at various activity levels, given guidelines such as strenuous exercise, walking, standing, sitting, or sleeping. Then, if you want to tell your client how many calories to eat in order to lose 10 pounds in 4 weeks, *Nutri-Calc* will determine the caloric allowance per week. This handy adjunct to the main program permits you to adjust the caloric allowance downward to accommodate declining basal metabolic rates. It would have been useful if the calorie program could communicate with the diet analysis program so the percentage of RDA would be readjusted with the updated calorie values.

Nutri-Calc's first 730 food codes are identical to those given in the *Nutritionist* program. Although *Nutri-Calc* has added over 160 fast-food and brand-name foods, it hasn't bothered to include these items with the documentation. Fortunately, you can abandon the printed code list altogether and get all the information you need on screen. *Nutri-Calc*, more so than any program reviewed, allows you easily to enter items and move around the data bank. A question mark (?) allows you to access food categories, which have sensible names such as "Dairy products, milk, etc." or "Sugars and sweets." Hitting the Return key lets you scan the entire group of foods. If you're interested in a particular food, type in enough information to elicit a unique response, and the program will search the category for that food. When you see the item you want, insert its code number, and the program will automatically return to the diary mode.

It is surprising, considering how much care was taken in designing the database, that you are not informed if all nutrients are listed for all foods. The program does not allow you to save the data on disk, and this limitation is certain to eliminate some professional users. *Nutri-Calc* is written on the UCSDp-System, so DOS users will be unable to make a backup of the program. Nonetheless, its easy database access makes this program one of the most efficient of those reviewed here.

One of the expensive elements in professional nutrient analysis is time, especially coding time. In response to this, *Diet Monitor* provides a guide for clients to improve accuracy in recording foods. The client's memory and ability to estimate portion sizes are, of course, the weakest links in the system.

A Printed Food List

Another notable aspect of this program is its ability to print the entire food list. Clients can review the foods and thereby give the best documentation possible. Simply buying or photocopying the lists is inadequate if you've appended it. Using this system, clients can be instructed to code the diaries themselves. Printing the food list is such a good idea, that, if the program is updated, an option should be included to define which pages or food categories to print. Furthermore, if you simply want to add to, rather than alter, the list, wouldn't it be better to print out only the new entries?

For clients with special dietary needs, *Diet Monitor* has the capacity to override the RDA and set minimum and maximum levels of your choosing. A patient may be prescribed a high-protein diet with at least 100 grams protein or a diet limiting cholesterol to 250 milligrams per day. If maximum amounts are exceeded, the report lists the foods causing the excess.

Although professional in design, the nutrient list goes overboard in its effort to be comprehensive. As an example, nutritionists know little about the trace copper or selenium levels in foods. In the same vein, biotin can be synthesized completely in the digestive tract. Food data like this is superfluous.

Also, the list of foods was not carefully planned. Why, in a 768-food list, were 42 lines allocated to herbs and spices? They are used in very tiny amounts and have essentially no nutritional value. A number of foods are duplicated in the program, and others are analyzed in impractical portions. For instance, how many grapefruit halves is 2 ounces raw grapefruit?

This program will suit you if you want the professional attributes that have been

Selecting Diet Software

Here's a list of some important questions to ask before you buy.

Once you have decided that buying a diet or exercise analysis package will enhance your practice, you will need more indepth information. The following questions should guide your selection.

- What are the system requirements? One disk drive or two; DOS, CP/M, or UCSD-p, or another system? Amount of memory required? Type of printer needed? Color monitor?
- How large is the food list? What foods are included? Are brand-name dishes included? Does the program list fast foods, TV dinners, deli items, or ethnic dishes? If the food list is extremely large; does it take a long time to analyze the food diary? How can you balance the two needs—time and food-bank size?
- Which nutrients are included? Do you need all of them? How complete is the analysis for some of the less common nutrients? If the diet includes foods which lack complete nutrient breakdown, does it warn you about the missing values?
- Are you interested in enlarging the list of foods? If so, how many foods can you add to the data base? Is the add-foods feature easy to use? Are updates provided by the company?
- Most programs compare diets to the RDA. Can you also compare with nutrient levels of your own choosing? Can the RDA be altered? Can the individual food records be saved on disk for comparison to future records to assess progress?
- How many levels or specific exercises are included in the program? When monitoring types of exercise, intensity, and duration of activity, you may want a complete list of sports and other calorie burners. When you want a good estimate of caloric expenditure, division of activities into light, moderate, and vigorous may be enough.
- What other programs are included in the software package? Diet planning? Weight monitoring? Shopping plans? Special foods calculation? Special sorts through the database? Messages to help clients improve their diet or exercise program based upon their own nutrition requirements? Are any of these useful in your practice?
- How are foods entered into analysis program—via code numbers, on-screen edit, or both? Is the method suited to your needs? If you employ someone to analyze diaries, it may be inexpensive to use code numbers, for the individual will soon learn the major codes. If you plan to enter the foods yourself just once a week, you may want a screen display with the option to scroll through the entire list to locate a specific food.
- If you are interested in weight-control diets, find out how caloric requirements are determined. Is the caloric value of exercise computed or is a standard value inserted. Does the program merely read a general value from the RDA or does it actually calculate the basal metabolic rate?
- Cost of program? Since programs range from $60 to $1,000 without the promise that "more means better," you should first decide what you need and how much you want to spend, then see what you can get.—***M.S.***

written into *Diet Monitor* and don't mind doing considerable work customizing and cleaning up the database.

For the Weight Conscious

A completely different kind of program, *Inshape* gives you the basic information on clients' diets, including how many calories they are eating and whether those calories come from protein, fat, or carbohydrate.

Foods are selected from the keyboard using food name, not codes. Scrolling through the food list to find the right choice usually works well, unless you know exactly which food you are looking for. In this case, it seems unnecessarily time-consuming. If you had been given an option to code the food, efficiency would be increased.

This program utilizes the PC's function keys to note when during the day (breakfast, lunch, supper, or snack) a food is eaten. Portion sizes may be entered either on the keyboard or the numeric keypad. And, without toggling the NumLock key, you can use the arrows and the PgUp and PgDn keys to reposition the food list.

For each day analyzed, you can chart the client's weight and, with the help of a second program, aerobic exercise points. *Inshape* will plot daily (see Figure 3) or even weekly comparisons for up to one year. This program works well for long-term weight reduction patients or those monitoring weight and exercise progress. With *Inshape*, each user gets a separate disk. The floppy disk becomes an actual part of the client's record.

Each of the programs reviewed here will meet the needs of certain health-care professionals or home users. The cost of the program is no indication of quality, so look at all features before choosing your diet program. The options here share one great benefit—they have no calories. ■

Marilyn Schorin is a registered dietitian and nutritionist and owner of Nutrifit, a nutrition- and fitness-consulting firm in New Jersey.

Multiplan Made Easier?

Users of Microsoft Budget can build Multiplan spreadsheets by responding to interactive questions. The trouble is, Microsoft doesn't yet have all of the answers.

Microsoft Corporation wants you to be able to use its popular spreadsheet program *Multiplan* "in record time." So, the Bellevue, Washington, software giant has brought forth a new family of products that can design your financial worksheets for you by filling in the formulas and numbers in the right places. Originally dubbed *Multi-Tool Expert Systems*, these packages now go by shorter, snappier names. For instance, the *Microsoft Multi-Tool Financial Statement Expert System* is now simply *Microsoft Finance*, and the *Microsoft Multi-Tool Budget Expert System* is *Microsoft Budget*. Other planned members of the family are *Microsoft Cash Plan* and *Microsoft Personal Finance*.

You can get an idea of what these programs do if you're familiar with add-on template packages for *Multiplan*, *VisiCalc*, and other popular spreadsheet programs. Templates are like preprinted forms in which you fill in the blanks. But unlike paper forms, templates for a spreadsheet program include formulas that calculate totals or ratios for you and thus spare you the work of entering the formulas. You simply add the right data.

Microsoft's new programs carry the idea of templates one step further by making them interactive. You don't have to accept a single set of preprinted formulas. Instead, you can pretend that the program is a business consultant. It asks you a series of questions; you respond both by keying in data and by telling the program about your business. Then, choosing formulas based on your business assumptions, the program designs custom worksheets.

To see how this approach works, I reviewed *Microsoft Budget*, an interactive template for *Multiplan* that produces a basic cost accounting system for a small business. The program produces worksheets that allow managers to play with alternative price and cost scenarios to see how they affect a company's bottom line. In addition, the system provides a "variance" worksheet that permits a manager to compare budget predictions with actual

---

Microsoft Budget
Microsoft Corporation
10700 Northup Way
Bellevue, WA 98004
(206) 828-8088
List Price: $150
Requires: 128K RAM, one disk drive, *Multiplan*.

CIRCLE 740 ON READER SERVICE CARD

performance to pinpoint problems.

The program comes on four single-sided diskettes (not copy-protected) with a 61-page loose-leaf binder. Instead of the IBM-style cardboard slipcover, the binder is wrapped in a plastic "easel box," which can be opened to form an easel that lets you prop up the manual while you're working (a nice touch, but I wish they would use a stronger plastic that didn't break so easily).

The manual is well written and well organized. In addition to instructions on how to operate the program and use it with *Multiplan*, the manual includes a mini-tutorial in cost accounting that explains the accounting principles used in each budget worksheet.

The manual also includes detailed, easy-to-follow instructions for "installing" the program to fit your particular computer. For most popular MS-DOS computers, the installation couldn't be simpler. You just indicate from a list of machines which one is yours. But if you have an off-brand or customized system, you'll need to answer detailed questions about the internal workings of your keyboard, such as "what sequence of characters starts highlighting?" Be prepared to haul out your hardware manuals and start typing in the escape sequences and control sequences.

I was able to bypass all the technical red tape because I tested *Microsoft Budget* on an IBM PC, one of the computers on the standard list. Then, because I have double-sided disk drives, I was able to copy the four single-sided distribution disks onto one double-sided floppy disk. This step took some sleight of hand, since Microsoft apparently assumes that most people will use the system with single-sided drives. After I copied the "installed" version of *Microsoft Budget* onto my work disk, I was able to ignore all the Install files, since you only use them once at the beginning of your work. Then I copied all of the support programs, and it all fit! I was proud of my electronic shoehorning, but it didn't save me all that much

Accounting for Microsoft Budget

The accounting features of Microsoft Budget are too rudimentary to be really useful, but they can be upgraded by the user.

To get an expert's view of the value of *Microsoft Budget* as a cost accounting system, I took a copy of the manual and a set of sample question sequences and corresponding worksheets to my accountant, Steven De Graff, a partner in the CPA firm of Wain, Samuel & Company of San Mateo, California.

Our review of *Microsoft Budget*'s worksheets focused on two main issues. First, do the worksheets form the basis of a useful cost accounting system, and second, can someone unfamiliar with cost accounting use the program?

Overall, De Graff felt that although *Microsoft Budget* embodies many sound accounting principles, it suffers from several oversimplifications and a few minor, but obvious, mistakes. To understand the software's good points as well as its shortcomings, let's take a closer look at what it does.

Microsoft Budget helps you prepare *Multiplan* worksheets that take you through the two major steps of cost accounting. First, you create six worksheets that build an operating budget that predicts your revenues and expenses. At the end of a budget period you create a seventh worksheet that compares actual revenues and expenses with your projections. This second step, called "variance analysis," lets you pinpoint problem areas (unfavorable variances) in the preceding period where costs were too high or revenues too low. This process also helps you prepare more accurate forecasts for future budgets.

In brief, the worksheets are as follows:

1. In the manufacturing overhead budget (for manufacturers only), you calculate a "variable overhead application rate," which is used to allocate variable overhead.
2. The unit cost budget (for manufacturers only) allows you to calculate the variable cost of producing one unit of product.
3. In the sales budget, you calculate gross sales revenue and net sales revenue for each product line.
4. The cost-of-goods-sold budget determines the variable cost of goods sold for each product and the total variable cost of goods sold for your entire line.
5. The selling and administrative budget projects variable and fixed selling and administrative expenses.
6. The operating budget calculates the net operating income for your business.
7. On the variance analysis worksheet, you re-enter projected figures from worksheets 1 through 6 for one accounting period and then enter actual revenues and expenses for the same period. The worksheet shows you where the actual and target figures differ. The variance worksheet is an after-the-fact analysis. If you overspend, it will indicate the "unfavorable variances" with a U. If your costs are lower than predicted, you'll have a favorable variance, marked with an F.

These worksheets help you build a so-called flexible budget. That is, *Microsoft Budget* asks you to separate fixed expenses, such as salaries or rent, that you have to pay regardless of your level of sales from variable expenses that

increase as your sales increase, such as commissions or overtime. The resulting flexible budget will show adjusted predictions of your variable costs, depending on your actual sales. For instance, if after a very successful quarter, your sales were 25 percent higher than you anticipated, the flexible budget would indicate that your variable costs should also have increased by 25 percent. According to De Graff, this is a classic, textbook cost accounting system, but it falls a bit short in reflecting real-world conditions.

The Activity Base

If you manufacture tables, you know the cost of materials and labor that go into each table. But how do you assign a variable cost, like machine repair, to each table? The answer involves a tricky concept, the "activity base." According to the *Microsoft Budget* manual, the activity base is "a common denominator, usually a direct cost input, used by all products." It goes on to explain that for an activity base "to qualify as an appropriate activity base, the amount of variable overhead incurred should be proportionate" to the activity base. There should be a logical connection between an increasing variable overhead and an increasing activity base. Thus, if machine repair is the source of variable overhead, then an appropriate activity base would be the number of units produced, since repairs are likely to increase as production and hence machine usage go up. Alternatively, indirect labor cost, such as janitorial service, is likely to increase proportionately with direct labor cost. The selection of the proper activity base is crucial for accurate budget predictions. If you're not familiar with cost accounting, you may make the wrong choice.

The *Microsoft Budget* manual implies that you should use one activity base to allocate all of your variable manufacturing costs. In De Graff's experience, however, most businesses need to use multiple activity bases to meet their budgeting needs. The Microsoft Budget system does allow you to create multiple overhead budgets if you decide to use several different activity bases.

The Microsoft Budget assumes that all variable administrative expenses vary directly with sales. You could make more accurate predictions if the system included an easy way to calculate costs based on many different variables. For example, commissions—a sales expense—would probably depend on actual collections rather than on sales. And the cost of interest could vary with a number of variables, such as the current interest rate, along with the amount of inventory and the amount of accounts receivable minus the amount of accounts payable.

De Graff also noticed a few small errors in the *Microsoft Budget* worksheets. For instance, the sales budget shows the unit price of bookcases for four quarters ($500, $550, $550, and $565) and then adds those prices together to give $2,165 in the totals column. Although it's undoubtedly true that $500, $550, $550, and $565 add up to equal $2,165, the total is meaningless since the unit price of a bookcase is obviously not $2,165. It would make much more sense either to show a weighted average of the four unit prices or to omit the figure entirely.

Insufficient Detail

Finally, De Graff leveled his strongest criticism at the variance analysis worksheet, which lacks sufficient detail to be a useful tool. "This kind of analysis would be meaningful if it included 20 different accounts and if it showed the variances account by account," he explained. But if you see an unfavorable variance of $1,500 in variable selling and administrative expenses, you don't know if the problem was that your employees were making too many telephone calls or if the salesforce overspent its entertainment budget.

All of these errors are correctable; that is, you can modify the worksheets using *Multiplan* to include more variables and more accounts. But that means extra work on your part and makes the *Microsoft Budget* worksheets less of a time-saver. To make the proper modifications, you would probably need a thorough understanding of cost accounting, as well as proficiency with *Multiplan*.

The *Microsoft Budget* worksheets do form the basis of a rudimentary cost accounting system, but they need modifications to be genuinely useful. The person most likely to benefit from *Microsoft Budget* is someone who understands cost accounting, who can make the necessary corrections on the worksheets, and who can make the right decisions during the question sequences. Steven De Graff, for one, feels that making the *Microsoft Budget* worksheets into a useful system wouldn't be any easier than building a system from scratch.—**D.P.**

disk swapping, as you shall see later on.

The package comes with a tutorial program called LEARN that teaches you how to move the cursor and talk to *Microsoft Budget*. The tutorial is pitched to the computer novice, so even if you've never used a computer before, LEARN will have you conversing with *Microsoft Budget* in about 10 minutes.

If you're already familiar with the spreadsheet program *Multiplan*, *Microsoft Budget* will seem like an old friend. Like *Multiplan*, *Microsoft Budget* has a command line at the bottom of the screen and a word-sized cursor that you move to select your next command. You move the cursor between the command line and the data entry area of the screen with the Tab key. You can correct your typing mistakes by using editing commands similar to those in *Multiplan*.

Questions and Answers

Once you complete these preliminaries, you're ready to begin the program to produce a worksheet for calculating the "variable application rate," which is used to determine whether budget variances are favorable or not. (See the accompanying sidebar, "Accounting for *Microsoft Budget*" for an explanation of this and other accounting terms.) Using *Microsoft Budget*'s "example case," I produced a worksheet that calculates the rate for a furniture manufacturer called Modern Furniture.

The questions that assist you in building the worksheet appear on a series of separate screens. The first screen (Figure 1) asks for your company name, the project name, the report name, and the description of the budget period. Unfortunately, you must type the same introductory information for each of *Microsoft Budget*'s six question sequences. It's too bad that Microsoft didn't think of providing a default file for filling in the company name and other items that are unlikely to change every time you run the program.

On the second screen (Figure 2) you list up to ten variable overhead costs that go into your variable overhead. The third screen (Figure 3) asks for the dollar amount you spend on each category. On the fourth screen (Figure 4) you choose your activity base (in the example case, direct labor hours). The fifth screen (Figure 5) asks for total units in the activity base. And finally, the last screen (Figure 6) asks if you're ready to write the data file.

```
OVERHEAD BUDGET :  BASIC INFORMATION

Enter company name.......................... :  MODERN FURNITURE
Enter project name.......................... : BUDGET PLANNING
Enter report name........................... : MANUFACTURING OVERHEAD BUDGET
Description of budget period................ : 1983




COMMAND:  Example Help Load Next Quit Review Save

Enter responses
Press tab to move to command line          99% Free  Multi-Tool: overhead
```

Figure 1: *The first question sequence requests basic information to identify the worksheet.*

```
OVERHEAD BUDGET
List categories by typing in one category name per line.
Suggested responses may be deleted or replaced.

                    Variable Overhead Cost   1 - Indirect labor
                    Variable Overhead Cost   2 - Supplies
                    Variable Overhead Cost   3 - Repair & Maintenance
                    Variable Overhead Cost   4 -
                    Variable Overhead Cost   5 -
                    Variable Overhead Cost   6 -
                    Variable Overhead Cost   7 -
                    Variable Overhead Cost   8 -
                    Variable Overhead Cost   9 -
                    Variable Overhead Cost  10 -




COMMAND:  Example Help Load Next Quit Review Save

Enter responses
Press tab to move to command line          97% Free  Multi-Tool: overhead
```

Figure 2: *The variance worksheet can accommodate 10 variable overhead cost factors.*

The end result of this question sequence is the worksheet in Figure 7. But you have to work a bit more before you actually get there. As you can see from Figure 6, *Microsoft Budget* will let you review your answers if you type R. Or you can save your answers in a response file by typing S, a handy feature in case you want to change one small detail and don't want to go through the whole question and answer sequence again. Or you can swap disks, type N, and build a Symbolic Link (SYLK) file. Now, you may ask, what's a SYLK file? I count it as one of *Microsoft Budget*'s flaws that you need to ask this question at all.

SYLK Links

A SYLK file permits you to store your worksheets in such a way that *Multiplan* can link them together in later operations. If we wanted to link the variable overhead application rates for Modern Furniture, for example, to calculate a multiyear average rate, our file and previous files would have

```
OVERHEAD BUDGET

Enter amount for each category.

                          Indirect labor :  $  315000
                                Supplies :  $  200000
                     Repair & Maintenance :  $  100000




COMMAND:  Example Help Load Next Quit Review Save

Enter responses
Press tab to move to command line          97% Free  Multi-Tool: overhead
```

Figure 3: *In the third question sequence, you fill in the dollar amounts for each variable overhead cost factor.*

```
OVERHEAD BUDGET : ACTIVITY BASE


                          direct labor hours - x
                           direct labor cost -
                        direct materials cost -
                      number of units produced -
                                      other -




COMMAND:  Example Help Load Next Quit Review Save

Type an 'x' beside one choice
Press tab to move to command line          97% Free  Multi-Tool: overhead
```

Figure 4: *In the fourth question sequence, you choose your activity base.*

to have been stored in a SYLK file first.

The reason for this complication lies in the way *Multiplan* reads worksheet data files. *Multiplan* knows how to read three kinds. The kind it reads most efficiently is the "normal" or "binary" format. When you're working with *Multiplan*, you work almost exclusively with these normal files, written in *Multiplan*'s own special code. (If you look at one of these files with the DOS TYPE command, you'll see strange gibberish, resembling Egyptian hieroglyphics, on your screen.) *Multiplan* can also read *VisiCalc* worksheets, so that people can switch from the competition. Lastly, it can read SYLK files.

Because *Microsoft Budget* talks to *Multiplan* using the SYLK format, you have to call up *Multiplan* and convert the *Microsoft Budget* SYLK file into a normal file every time you complete a question sequence. If you forget, *Multiplan* won't be able to "link" your budget worksheets. That is, it won't be able to copy totals or account information from earlier worksheets. (Incidentally, if you look at a SYLK file with the DOS TYPE command, you'll see ordinary numbers and letters. Using one of the appendixes in the *Multiplan* manual, you can actually decode the SYLK file, seeing where the data and formulas should appear on the worksheet.)

As if the file linkage procedure weren't clumsy enough, *Microsoft Budget* also makes it difficult for you to keep track of all these files. In later question sequences, the program asks for the names of the "normal" *Multiplan* files that you've already created, so that it can tell *Multiplan* what files to link. But you get no help remembering these names because you can't look at your disk directory without leaving *Microsoft Budget*.

Perhaps most annoying is that in some (but not all) of the question sequences, *Microsoft Budget* insists on naming the SYLK files and writing them on drive A. For instance, the question sequence in Figure 1 ends after *Microsoft Budget* writes a SYLK file named Overhead on the disk in drive A. You're not allowed to name the file yourself, so you have to remember to rename your previous Overhead SYLK files if you want to run through the question sequence more than once.

I can see how, in the normal course of things, Microsoft might think it was doing me a favor by writing the SYLK file on drive A and telling me to swap disks. It would clearly be necessary if I had only one disk drive. It would also be necessary if I had two single-sided disk drives, since some of the programs would be in drive A and some in drive B. But with my two double-sided drives, I was able to fit all of the *Microsoft Budget* programs onto one disk. Thus, if Microsoft had let me, I would have preferred keeping the program disk in drive A and my data disk in drive B. Alas, such flexibility is not built into *Microsoft Budget*. It insists on having some of its programs in drive A and on writing data to drive A. So, some disk swapping is inevitable.

Antibeep Protection

If you decide to use *Microsoft Budget*, be sure to put a write-protect tag on your

program disk. If you don't and if—forgetting to swap disks in drive A—you try to save your SYLK file on the program disk, *Microsoft Budget* will discover that it doesn't have enough room, and it will beep endlessly at you until you reset your computer.

Assuming you get past all of these hurdles, you can put the *Microsoft Budget* disk away, fire up *Multiplan*, load in the SYLK file, write a normal file for future linkages, and see the worksheet in Figure 7 on your screen. Now you're ready to stop concentrating on the software and start concentrating on your budget. Once you have all of your worksheets prepared, you can go on to see how different business decisions will affect your profits.

Unfortunately, although I am impressed by the basic idea of defining a worksheet through a dialogue with a computer, I have concluded that *Microsoft Budget* needs a lot more refining. You often have to reenter the same data; you have to switch disks frequently; you have to spend a lot of time converting files from one format to another—in short, you have to do a lot of work that the program should be doing for you.

On the positive side, *Microsoft Budget* is able to exploit one of *Multiplan*'s special talents: its ability to create "interrelated" or linked worksheets. Six of *Microsoft Budget*'s seven budget worksheets can be linked, so that when you change data on one worksheet, the new data appear on all of them. If you wish, you may choose not to link the worksheets and to manually enter new data.

You must be fairly proficient with *Multiplan* before you can use *Microsoft Budget*. And to prepare a budget that truly reflects the state of your business, you also need a thorough understanding of cost accounting (see the accompanying sidebar). At best, *Microsoft Budget* can give you some help in preparing budget worksheets, provided you already know what you're doing.

If *Microsoft Budget*'s worksheets meet your cost accounting needs, you might overlook the system's shortcomings and buy it anyway. It's bound to be a quicker way of designing worksheets than developing the models yourself, and it's more flexible than a template. But it might be worth waiting until the next release to see if Microsoft can iron out some of the system's more annoying wrinkles. ■

```
OVERHEAD BUDGET : ACTIVITY BASE

Direct Labor Hours

Estimated total activity base units for this
budget period :.............................. 205000




COMMAND:  Example Help Load Next Quit Review Save

Enter responses
Press tab to move to command line          97% Free  Multi-Tool: overhead
```

Figure 5: *The fifth step is to enter the total number of direct labor hours in order to specify the size of the activity base.*

```
All needed information is complete.
Use REVIEW to review responses.
Use SAVE to save responses.

To build Symbolic Link (SYLK) file, insert data disk and use NEXT.




COMMAND:  Example Help Load Next Quit Review Save

Select option or type command letter
                                                98% Free  Multi-Tool: overhead
```

Figure 6: *The sixth screen announces that all information needed for the worksheet has been entered and provides a menu of options for subsequent steps.*

```
MODERN FURNITURE
BUDGET PLANNING
MANUFACTURING OVERHEAD BUDGET
1983

Activity Base:
  Direct Labor Hours
  Expected Units:                                    205,000

VARIABLE MANUFACTURING OVERHEAD
-------------------------------------------------------------
  Indirect Labor                                     315,000
  Supplies                                           200,000
  Repair & Maintenance                               100,000
-------------------------------------------------------------
TOTAL VARIABLE OVERHEAD                              615,000

VARIABLE OVERHEAD APPLICATION RATE                     $3.00
  (per direct labor hour)
```

Figure 7: *The final worksheet calculates the variable overhead application rate ($3 per direct labor hour).*

Pretty Pixels

Prentice-Hall presents ExecuVision, a program designed to help the frustrated executive get a bigger piece of the pie through professional quality graphics that even an amateur can create.

Today's executive spends a good part of his time preparing for meetings. If he's fortunate enough to have a PC, he has access to a number of software programs that enable him to organize and present data in a legible form. When reports and graphs aren't sufficiently convincing, the executive has to commission a graphic artist. Unfortunately, deadlines and budgets rarely permit the luxury of a professionally rendered chart or display. Now there is an alternative solution for those harried executives, Prentice-Hall's *VCN ExecuVision Graphics Presentation Program*. *ExecuVision* is to graphics what *VisiCalc* is to spreadsheets.

VCN ExecuVision: The Presentation Graphics Program
Prentice Hall, Inc.
Business & Professional Division
Route 9W
Englewood Cliffs, NJ 07632
(201) 592-3283
List Price: $395.00
Requires: PC-DOS 1.1, 128K RAM, two disk drives, color monitor, and a color graphics adapter, Epson MX-80 printer is recommended.

CIRCLE 800 ON READER SERVICE CARD

This program promises its user his own personal art department capable of producing professionally rendered images with cut-and-paste options, sketching and text capabilities, and special effects such as animation—all in 64 glorious colors.

These are only some of the features *VCN ExecuVision* (herein referred to as *EV*) provides. It's also capable of sorting, dumping, and automatically running slides. Prentice-Hall claims that virtually anyone can produce a slide show with the program almost immediately—and best of all, the company is probably right!

The demo package I worked with came with two disks—the main program and a demonstration slide library.

Integrated Programs

Basically, *EV* is a combination of two types of programs: graphics and file manager. Because both are integrated on the main disk, they act as one program, using the same menus, features, and slides. Getting from one feature to the next is simply a matter of moving the cursor with the spacebar and entering your choice. (The Enter key is only used for menu operations, never for entering a line of text—something that must be remembered when in the Text mode.) If you enter the wrong option, you must select the Exit option to get back to the previous menu.

The database that contains the slides is kept on a library disk. The one that comes with the program is primarily for demonstration purposes: however, some people may find certain elements of it useful. Additional libraries can be purchased separately. Prentice-Hall expects to have six slide libraries out at the beginning of the year: Borders: Initials and Decorative Design; Industry and Business; Professions; The World's Faces and Figures; International Symbols; Maps. Although no price has been set, the expected cost is somewhere between $60 and $80. Eventually, the company hopes to add a few more, each specially designed for specific professions and industries.

Before *EV* can be used, DOS 1.1 must be copied onto the *EV* program disk. In order to avoid erasing one of the program's professionally produced slides, you are advised to format and initialize

your own data disk on which to store the slides you create. Once DOS is copied, you can do this by using the Initial feature in the Tools option. After initialization, load the EV program, and it will greet you with the first menu, which offers the options Create, Prepare, Print, Run, and Quit.

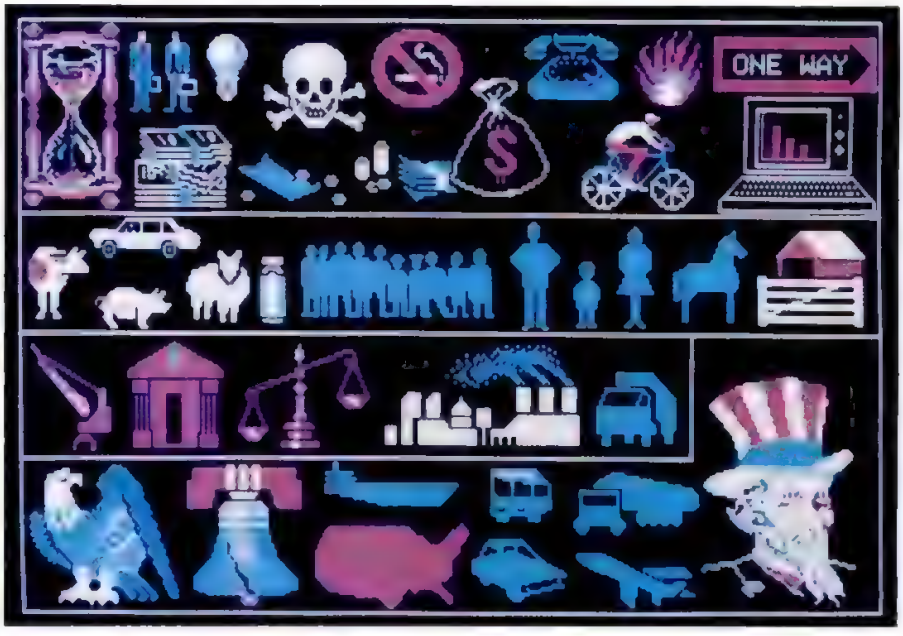
Residing within each of the four main options is virtually every feature necessary for putting together a slide presentation. The Create mode produces the actual slide. Once created, slides are organized in the Prepare mode. If you want a hard copy, you enter the Print mode. As expected, the Run mode allows you to run the entire presentation.

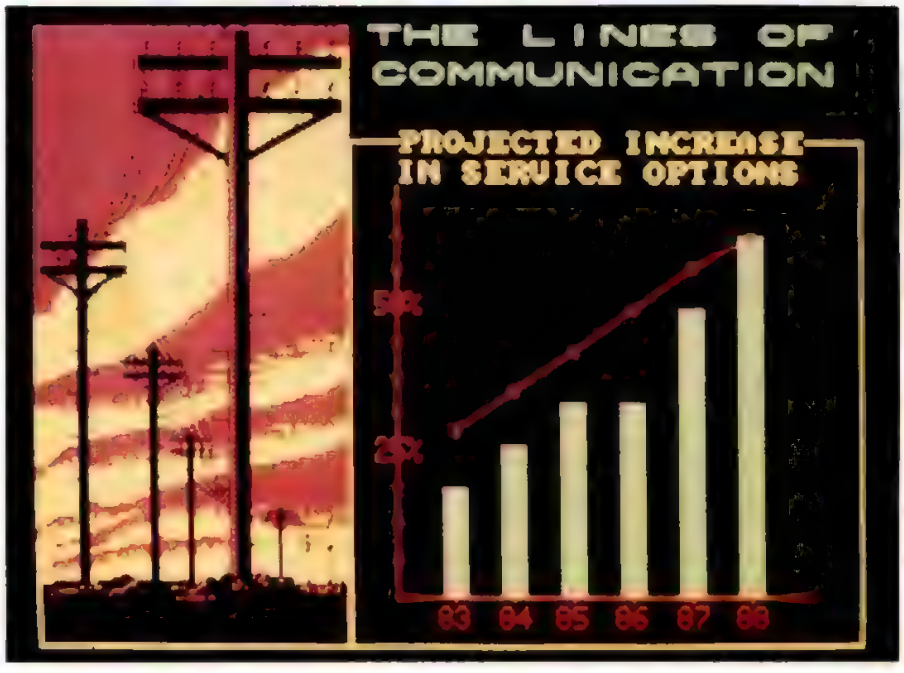
Menu-Driven Selections

When you first enter the Create mode, you are faced with a 12-choice menu. Most of these options are self-explanatory; five (Save, Load, New, Exit, and Dump) are common to many programs. The remaining seven options (Object, Tools, Text, Sketch, Cut, Color, and Motion) are easy to remember once you have gone through them.

The Object feature allows you to create various shapes and manipulate them on the screen. For example, you can create a box, scale it so that it resembles a bar in a graph, copy the shape several times, move each one alongside the original, and then color them in. Or, you can create a diamond to enclose lines of text and then add an arrow to highlight some specific word or phrase. Note that the Move function affects only the object created. Any images or lines of text enclosed by the object remain behind.

The scaling, in this mode and others, is accomplished using the Alt key and any one of the numeral keys. Alt + 1 is the smallest increment, and Alt + 9 is the largest. (In the Motion option, 1 equals the slowest speed and 9, the fastest.) One interesting note: while scaling down a circle, I suddenly found myself staring at a blank screen. Evidently, the designer decided to define a pixel as the smallest possible circle. I wish he had told me beforehand; I thought I was seeing things.





ExecuVision **enables an amateur to make the color slides (shown on these two pages) using symbol libraries, a sketch mode, or a combination.**

In addition to the Initialization function, the Tools mode provides the user with an eraser, two rulers (x-axis and y-axis), and a plot menu. The rulers are helpful when trying to center objects and text on the screen or when attempting to decide exactly where the forward motion of an object will end so that the next slide in an animated series can express the desired motion.

When you use the eraser, it's a good

idea to be careful and scale it down to size. The tendency is to wipe off unwanted designs with broad strokes. A scaled-down eraser may take more time, but you probably won't have to go into Sketch mode to repair any damage.

Charts

For those interested in percentages, the plot menu allows you to draw pie, bar, or line charts. In each case, the program asks the user to enter the figures separated by commas. The system will approximate percentages if the user doesn't include a maximum by typing in the "at" (@) sign at the end of the data. For example, a pie chart I created approximated the following figures—57, 25, 25—as 50, 25, 25. By the same token, when I entered a maximum of 100, the computer informed me that I had exceeded that amount. The Bar Graph menu allows the user to color in the bars without exiting to another menu. Before using the plotting functions, you must have objects on screen. If there aren't any, the program informs you and refuses to do anything with the figures.

Aside from the manual, the Text mode is perhaps the weakest link in the entire *EV* package. You can select ten different fonts, including Futura, bold, and italic. By hitting the F1 key, the user can change the point size with the arrow and Shift keys. However, the largest type size available is 30 by 30 (I presume pixels, but I'm not certain since the scale is never clearly defined). So if you need a larger type size you have to draw your own with the Sketch mode.

> The scaling is accomplished using the Alt key and any one of the numeral keys.

When writing with the Text feature, you must remember not to hit the Enter key; this will bring up another menu. Instead, after typing in a line of text, reposition the cursor with the help of the directional arrows in conjunction with the Alt key. Another minor annoyance: Hitting the spacebar will not move the text to the right but rather erase whatever was typed, which makes text centering tedious. You may sometimes find yourself retyping lines in order to center them properly. Finally, if the Alt key and an Arrow key are released simultaneously, either an unwanted character is printed or the cursor begins floating. None of these flaws makes the Text feature inoperable: they only prevent the program from being perfect.

The Sketch mode is one of *EV*'s few modes that is not menu-driven. Instead, the cursor appears in the center of the screen, and you simply begin sketching using the Shift and arrow keys. Position the cursor by unlocking the Shift key and hitting any of the eight arrow keys. Scaling is performed with the Alt and numeral keys. The pixel control is so fine that a good artist can sketch almost anything.

You can call up a variety of cursor colors—from gray to black to light blue to purple—by hitting the F9 key. You can use these colors to paint and shade images. By using the same cursor and background color, you can erase design errors. The Del key can also be used to erase. And if you draw an inappropriate line, use the Del key to erase the last straight line drawn. Hitting it twice will erase the next to last line, and so on, all the way back to the beginning of the sketch.

Using the Library

If you are interested in giving artistic presentations, perhaps the most valuable option in *EV* is the cut menu. You can cut and paste together a slide far faster than any graphic artist could. A pix (any image that is cut and then saved), can be moved around the screen, deleted in part or in total, copied onto the screen (provided space permits), and mixed with the background color or design. The Cut menu is *EV*'s greatest strength, because it enables you to utilize images and designs from the slide libraries to your own presentation.

For example, if you wish to create a storefront display of microcomputers, all you have to do is load a picture of a micro onto the screen. Presuming you already have created boxes to resemble counters or sketched tables and shelves, you can then fill them by copying the original micro and

positioning it all over the screen. Only one example is needed to create a multitude of images.

All the features in the Cut menu are performed with the help of a "cut box." When you hit the F9 key, the color of the box can be changed to a contrasting one to prevent it from blending into the background. Scaling the box is performed with the Shift and Arrow keys. Make sure the box encloses only the area that you wish to cut; otherwise, details from nearby images will be saved along with it, and you'll be forced not only to redraw the missing pieces but to erase the unwanted ones.

Coloring is achieved by selecting one of two options from the Cut menu: choice and fill. There are a total of 64 colors to choose from; selections are made by using function keys F5 through F10. Although the colors are divided into foreground and background, only one palette or color set of four colors can be used for any given slide at one time. This is a hardware, not a software, limitation. The manual supplies a color chart to help you with the color combinations.

Using Motion feature, you can animate any object on the screen at one of nine speeds. If desired, a trail can be left behind showing the points of motion. The object being animated can also be inverted or mixed with the original image. Once again, the user must be careful when scaling the cut box, or you might find only part of the image being animated. Animated slides can not be saved from one disk to another; they must be transferred (an option in the Prepare phase). When you save an animated slide to another disk, the motion is lost. Unfortunately because the manual does not have centralized references to motion creation, I learned this the hard way.

The Prepare phase is essentially a database management program. Slides are displayed, renamed, copied, deleted, and transferred to another disk. The user can scroll through the directory, swap the order the slides appear in, skip them entirely, or return everything to its original state. None of the features are exceptionally difficult to learn. In fact, I ran through all of them without having read that section in the manual.

Printing

There are five functions in the Print phase, and all of them are exceedingly straightforward and useful. Perhaps the most useful is the one that prints out all the slide and pix directories. Without this, you might forget the name under which a certain image was saved. The Style function informs the program how the slide should be printed: horizontally, vertically, reduced, enlarged, or continuous. In the latter option, the slides are printed as if they were one long slide. There is even a Color Print menu that alters the texture of the print by varying the pixel density of the printer.

Who should buy ExecuVision? Not someone who just wants to create an occasional pie chart.

With the options in the Run mode, you can either control your slide presentation yourself by running the slides with the Arrow keys or allow the PC to run them by selecting the Auto-Run function. Last-minute changes can be made by using the Entry function. The Auto-Run/Time Menu is broken down into seven time intervals ranging from 4 seconds to 4 minutes. After selecting the interval desired, you simply hit Enter again to start running the program.

More than just the features discussed here are available on the *EV* program. Nor are they necessarily the program's biggest asset—one look at the accompanying slides should tell you that. What all these features do indicate is that Prentice-Hall has lived up to its promise of delivering a personal art department.

The program comes with a fairly well-written 446-page manual. Most of it is devoted to tutorials. For those who have had some experience with other graphics programs, there are "fast track" sections that condense the tutorials to about 30 pages. Fast tracks are divided into three columns: Purpose, What You Do, and What the Computer Displays. However, I don't recommend the fast tracks as a substitute for reading the manual—far too many things can go wrong. For example, there is no centralized listing of menus, so until you familiarize yourself with the program, you can easily remain unaware of an important feature.

Who should buy *EV*? Definitely not someone who just wants to create an occasional pie chart. Although the program has plotting capabilities of its own, anyone buying it to draw a simple graph is using a sledgehammer when a thumb would do. However, if you use artwork in your presentations, or if you believe that graphics add that certain something, then *EV* is the answer. It has drawbacks—the most obvious being its lack of compatibility with anything other than *VisiTrend/Plot*—but the disadvantages are far outnumbered by the advantages.

EV won't replace a graphic artist—after all, there won't be slide libraries for everything that is needed. What I do believe, though, is that the astute graphic artist will probably be using *EV* to produce his work whenever possible, and that the average executive who decides to pick up a copy of *EV* will end up saving a lot of time before meetings.

If a picture is worth a thousand words, does it follow that a graphics presentation program is worth a thousand word processor programs? Not quite. Words will always be with us; however, these programs will always have a place in today's visually oriented society, and I suspect that Prentice-Hall's *VCN ExecuVision* will become the standard against which other programs will be gauged. ■

Wising Up With KnowledgeMan

This all-purpose package, combining database management and spreadsheet capabilities, gives the PC the power to challenge the minis and maybe even a few mainframes.

According to its authors at Micro Data Base Systems (MDBS), *KnowledgeMan*, also known as *Knowledge Manager (KMan)*, is a "comprehensive, multipurpose system for handling all of your information processing needs, including data management, ad hoc inquiries, spreadsheet analysis, statistical analysis, screen I/O forms management, printed forms management, procedures, and functions." Sounds great, whatever you call it.

Knowledge Manager
Micro Data Base Systems
Box 248
Lafayette, IN 47902
(317) 463-2581
List Price: $500
Requires: 192K RAM, two double-sided disk drives.

CIRCLE 711 ON READER SERVICE CARD

The reader might assume that MDBS has merely linked a *dBASE II*-type relational database manager to a spreadsheet and wrapped the whole thing up in a new advertising campaign—kind of like *1-2-3* working in a structured programming environment.

Wrong!

KMan is a remarkable piece of software, still not wholly polished in Version 1.05, but nevertheless a milestone in micro software design. The heart of *KMan* is a relational database management system that uses the same SQL query language used in many mini and mainframe DBM systems. Basic operations are similar to those used in *dBASE II*. But these products differ widely. (There is a temptation to compare all relational database managers to Ashton-Tate's *dBASE II* because it is used so widely. Unfortunately, this approach can force the product being reviewed into a *dBASE II* environment that fails to bring out its unique attributes. I'll do my best to avoid that.)

Consider for a moment the specifications in Figure 1. These database design limits match or exceed those on many mini and some mainframe database managers. *dBASE II* users will note the "limits" on records per tables, characters per records, fields per record, fields per index key, and the number of tables that can be open at once. For all practical purposes there are *no* limits—at least no software limits that

can be hit before the user has maximized the hardware capability.

KMan's liberal limits on field, record, and database sizes will enable many computer users to move databases off minis onto micros.

For example, I have a complex but shallow database that contains the performance characteristics of 300 current-production civil aircraft. It's so complex that, even though it holds only a relatively small amount of data, it ran only on a mini.

This type of database was made to order for *KMan*. The SQL query language makes ad hoc inquiries a snap. When I request a selection of all helicopters manufactured by Bell Helicopter Corporation that have a seats-full range greater than 350 nautical miles and showing the standard and fully equipped prices and the ratio of fully equipped to standard price, it requires only a single-line command:

```
LIST
MANU,MMOD,FPRICE,BPRICE,
BPRICE/FPRICE
FOR MANU = "BELL"
AND SRANGE > 35Ø ORDER BY
AZ BPRICE
```

The output of a similar command is shown in Figure 2. Note that a full set of statistics was generated for each numeric field and minimum and maximum values were shown for string fields.

Records per table	65,535
Characters per record	65,535
Fields per record	255
Characters per field	65,534
Numerical accuracy	14 sig. digits
Command line length	unlimited
Index keys per table	unlimited
Fields per index key	65,535
Index key length	65,535
Tables open at once	unlimited
Control breaks	unlimited
Elements per screen form	unlimited
Elements per report form	unlimited
Program length (lines)	unlimited
Working variables	unlimited
Rows per spreadsheet	255 max
Columns per spreadsheet	255 max

Figure 1: *As you can see,* KnowledgeMan *is more constrained by machine limits than software capabilities. Many first-time users of* KMan *have abandoned other database managers because of their limitations in the first four parameters shown in this table.*

Even if *KMan*'s capabilities stopped with liberal record/field limits and SQL, it would be well worth its $500 price for database designers whose long, flat, shallow databases have kept them locked to expensive minis.

But there's more to *KMan* than we've seen so far.

The Working Environment

Once loaded, *KMan* creates a powerful programming and data management environment. The key to working in it is an understanding of the *KMan* concept of variables.

KMan has four major classes of variables, and each one plays a different role during *KMan* processing.

Field variables are database fields. (These are similar to the field names used in *dBASE II* and other DBM systems.)

Working variables are unrelated to the field variables of the databases. Rather, they are similar to working variables in BASIC and other programming lan-

MANU	MMOD	SRAN	FPRICE	BPRICE	TO1	
Bell	LongRanger II	254	495000	516600	0.95819	
Bell	LongRanger II*	270	550000	571600	0.96221	
Bell	222B	285	1595000	555000	2.87387	
Bell	222U	285	975000	1000000	0.97500	
Bell	JetRanger III	306	360000	381600	0.94340	
Bell	412	346	1975000	2150000	0.91860	
Bell	222	348	1195000	1495000	0.79933	
Bell	212	386	1600000	1780000	0.89888	
Bell	214ST	533	4250000	4250000	1.00000	
		3013	12995000	12699800	10.32948	Sum
		335	1443889	1411089	1.14772	Ave
		7340	**********	**********	0.42239	Var
		86	1191616	1235674	0.64992	Sdv
Bell	212	254	360000	381600	0.79933	Min
Bell	LongRanger II*	533	4250000	4250000	2.87387	Max

Number of Observations: 9

Figure 2: *This listing from a* KnowledgeMan *table was generated by the command SELECT MANU, MMOD, SRANGE, FPRICE, BPRICE, FPRICE/BPRICE FOR MANU = "Bell" ORDER ASCENDING SRANGE. Note that statistics are automatically generated for all numeric fields and maximum and minimum values are shown for string fields (MANU and MMOD). The asterisks in the variance row indicate that the number is too large to print at the default column widths. Notice that a virtual (or temporary) field—T01—was created on the fly. The ordering was dynamic and did not generate a sort of the database itself.*

guages. In fact, they are assigned values in a similar way, with LET statements. For example:

```
LET AMT = 987
```

assigns the numeric value of 987 to the working variable AMT. *KMan*'s working variables are similar to *dBASE II*'s memory variables, but they are not limited in number nor are they necessarily attached to a given table (database file).

Cell variables are used in *KMan*'s spreadsheet mode. Like many spreadsheet systems, *KMan* uses alpha characters to identify columns and numeric characters to identify rows. Therefore, the *KMan* variable #C5 refers to the contents of the cell in the third column and the fifth row. The number sign (#) is always used as a prefix to a cell variable. Cell variables can be addressed from anywhere in the *KMan* environment, whether or not the spreadsheet is displayed.

Environment variables, as the name implies, control the *KMan* working environment. All take the form E.ACTION. For example,

```
LET E.SIGD = 9
```

changes the number of significant digits used in calculations from the default setting of 14 (under PC-DOS) to 9, and

```
LET E.PDEP = 50
```

sets the printer page depth to 50 lines. There are more than 50 environment variables. They control every facet of *KMan*'s I/O facilities and program control.

Utility variables round out the picture (see Figure 3). These variables, constantly updated by *KMan*, handle many housekeeping chores and can be called at any time from anywhere in the *KMan* environment.

Field variables, as with all database management systems, must be identified by type (string, numeric, or logical) when the table and its fields are defined. Working variables, on the other hand, are defined by the values assigned to them. For example, if at one point in a *KMan* session we issue the command

```
LET TEST = 1234,
```

TEST becomes a numeric variable with the value 1234. If, at a later point, we issue the command

```
LET TEST = "BOB",
```

TEST becomes a string variable with the value BOB.

Like all good programming languages, *KMan* includes string-manipulation functions and functions that change strings to text and text to strings (see Figure 4).

Get the Picture?

KMan stores and operates on plain vanilla numeric variables. However, an equivalent to values stored in both string and numeric variables can be established

```
#AVER          One dimensional array holds the average
                 statistics computed by the most recent
                 table selection.
#CNT           Item count (see #AVER)
#DATE          System date or specified date override
#DEFAULT       Name of current default table
#DSKOUT        Name of current disk output file
#FOUND         True if retrieval command finds a record.
#MAX           Max statistic (see #AVER)
#MIN           Min statistic (see #AVER)
#STDV          Standard deviation statistic (see #AVER)
#SUM           Sum statistic (see #AVER)
#TITLE         Default page title for table output
#USER          Name of the present system user
#VAR           Variance statistic (see #AVER)
```

Figure 3: KnowledgeMan *keeps these utility variables up to date at all times, thus relieving the programmer of many housekeeping chores. The statistical variables are particularly handy.*

```
ABS (nexp)             Absolute value
ARCSIN (nexp)          ARCSIN of radians in (nexp)
CURREC (table)         Current record number
EXP (nexp)             e to the power of (nexp)
LEN (sexp)             Counts the characters in (sexp)
LN (nexp)              Natural log of (nexp)
LOG (nexp)             Base-10 log of (nexp)
MATCH (sexp1,sexp2)    Looks for sexp2 in sexp1
MAX (nexp1,nexp2)      Returns larger value
MIN (nexp1,nexp2)      Returns smaller value
RAND (nexp)            Seeds random number from 0 to 1
ROOT                   Solves polynomials
SIN (nexp)             SIN of radians in (nexp)
SQRT (nexp)            Square root of (nexp)
TONUM (sexp)           Converts (sexp) to numeric value
TRUNC (nexp)           Returns integer value of (nexp)
VAL (sexp)             Converts 1st chr of (sexp) to ASCII num
CHR (nexp)             Converts ASCII number to chr
LOCASE (sexp)          Converts value of (sexp) to lower case
SUBSTR (sexp,b,l)      Returns substring starting at "b", "l"
                         characters long
TOSTR (nexp,l,d)       Returns (nexp) as string "l" characters
                         long with "d" decimal places
TRIM (sexp)            Trims trailing blanks from (sexp)
TYPE (var)             Returns type of variable
UPCASE (sexp)          Converts value of (sexp) to upper case
EOT                    TRUE if last record accessed
FILEX (filename)       TRUE if filename is on disk
ISALPHA (sexp)         TRUE if 1st chr is alpha
ISDIGIT (sexp)         TRUE if 1st chr is numeric
```

Figure 4: KnowledgeMan *functions can be used anywhere in the* KMan *environment—spreadsheet, procedures, or in interactive query language sessions.*

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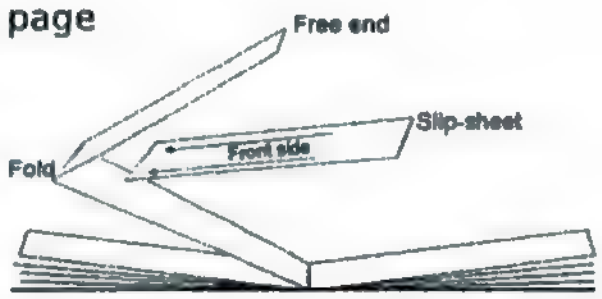

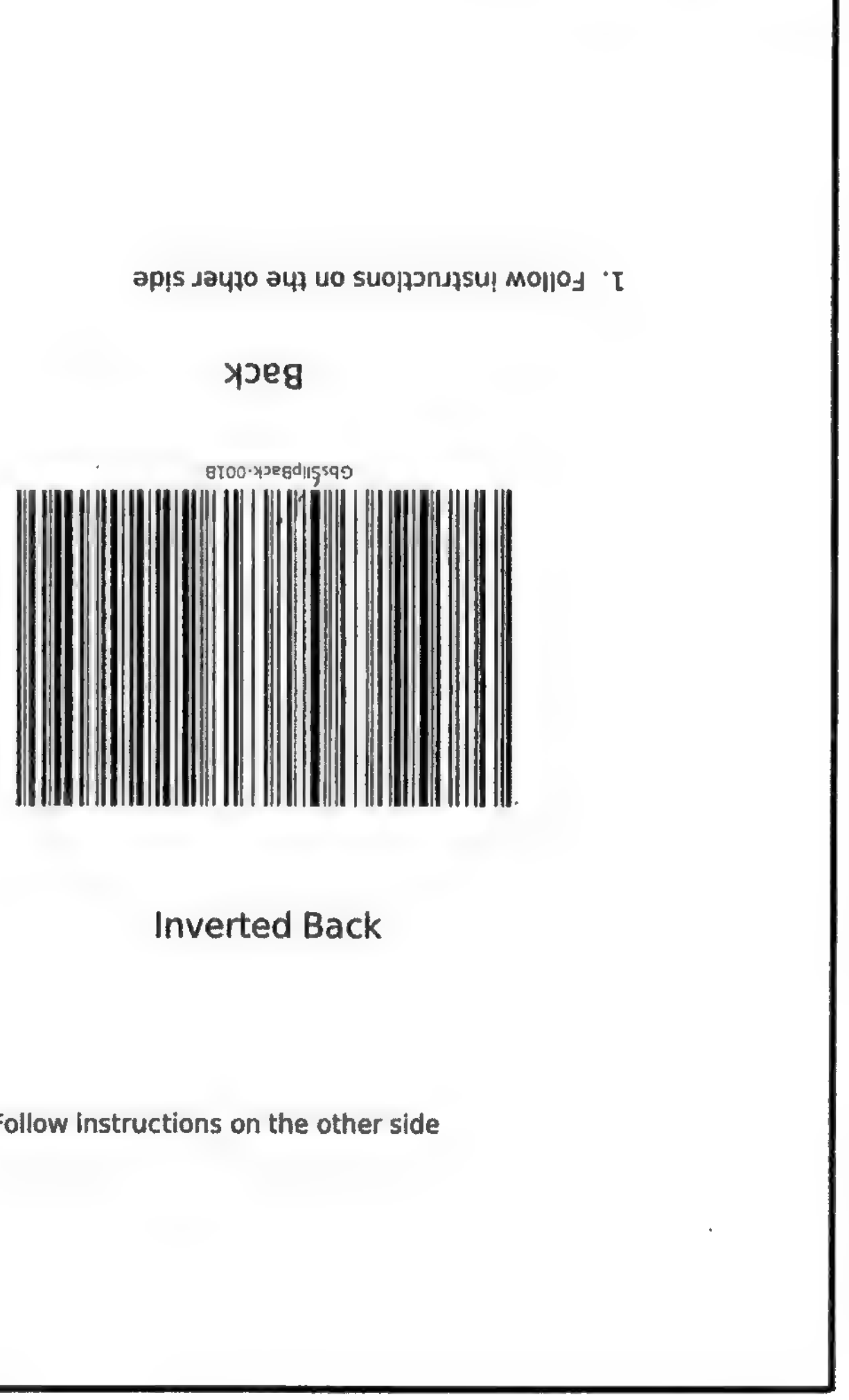

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at any time and anywhere in the *KMan* environment using an edit mask called "picture."

Pictures are very powerful features but getting the required results demands the user's close attention. This is one of the few areas where *KMan* (at least in version 1.05) falls down. For example, it is often desirable to express a number (either in input form or outputs of various kinds) in a form like this:

```
$1,554,987.
```

Assuming the value is kept in a numeric variable, *KMan* stores the number as 1554987.00000. When the value is called for output with a USING PICTURE statement, the commas and dollars sign are added, and the value is rounded.

Suppose we had a list of parts with prices stored as: 1554987, 678 and 1432. Listing these values with a picture of $d,ddd,ddd would produce the following list:

```
$1,554,987
$ .    ,678
$ .  1,432.
```

I couldn't find a way around this and until it is fixed, I suspect the picture facility will fail to meet the needs of many output operations.

Manipulating Field Variables

The Englishlike commands of the SQL interactive query language are the key to getting information out of the tables or databases. The civil aviation database displayed in Figure 4 was one example.

Basically, the user selects (or lists) a group of named fields for those records that meet certain criteria. The statement can include instructions to compute new fields (for display) on the fly, to order (dynamically sort) the output using nested key fields as needed, and to display the whole package using various pictures and control breaks. The query language is easy to master, totally logical, and extremely powerful. Once you learn it, you may become hooked, and you will probably find yourself unhappy with any other interactive DBMS query language.

The Spreadsheet

One of the more powerful (but somewhat unfriendly) features of *KMan* is its built-in spreadsheet.

If you're expecting Lotus's *1-2-3* or *MultiPlan* when you invoke *KMan*'s CALC command, you will be disappointed—that is, if you're hoping for a pretty screen and all sorts of pointer-controlled, self-documenting commands. If you're looking for raw power, however, *KMan*'s CALC facility is unmatched.

CALC wouldn't have been included in *KMan* if it couldn't read all or a portion of a table (database) and present the data for what-if types of manipulation. Nor would it make much sense if it couldn't create a database by organizing rows into records and columns into fields for later table storage, similar to the way *1-2-3* works.

It's the extras that are really impressive. For example, the visual appearance (color, reverse, blinking) of the value of any cell can be changed depending on the value of the cell. This allows you to create spreadsheets that deliver user prompts and the good and bad news of what-if exercises in real time. You can order cells to turn red (on a color monitor) or flash (on a monochrome monitor) if the value in the cell goes negative (a quick way to tell the boss that the last change he made wasn't such a hot idea).

Perhaps even more important than these bells and whistles is the CALC's capability to use not only its own set of spreadsheet commands but also those of the working, environment, utility, and field variables previously mentioned. In fact, a single cell can be assigned the value of an entire program by telling the cell to call a procedure and pass values back and forth. And any variable can be made global (the default) or local to a procedure.

My only real disappointment with *KMan*'s CALC spreadsheet is that the cell cursor won't point to other cells while entering an equation. In other words, an equation referencing other cells must be

A Useful Utility

MOMAN speeds up KMan operations and helps make use of all the memory available.

One of the truly innovative utilities in the *KMan* package—one sure to be copied by other software vendors—is a module linker called *MOMAN*.

KMan is a big program. It includes the executive, 16 overlays, and several terminal and printer driver files—all in all, well over 200K. It's designed to run on a system with a minimum of 192K RAM. Users with lots of memory often use virtual disks to speed up overlay access. Version 1.05 of *KMan* removes the need of configuring a virtual disk and moving the overlays to that electronic drive by providing a linker program that will put as many of the overlays as memory size will allow into a single .exe file.

When *KMan* and its 16 overlay files are linked by the *MOMAN* utility, the user ends up with a total of 274K that loads and runs as though it were a single program. To hook up *KMan* and all 16 overlays with the *MOMAN* utility, you need about 30K for DOS, 64K for *KMan*'s workspace and 274K for the combined *KMan* file. Getting rid of the overlays speeds up *KMan* and gives the user the opportunity to make full use of the extra memory in the system.

Smaller versions of the program accommodate smaller amounts of RAM. In this case, you select the overlays with the commands you call upon most often. The remaining overlays operate as usual through disk access.—**R.A.**

typed in on the command line.

Pulling It All Together

When I first sat down with the *KMan* documentation (all 300 pages of it), I was almost defeated by an embarrassment of riches. How do you control a piece of software that puts few real constraints on the database format, and allows you to use any type of variable, any time, anywhere?

The answer is in the structured procedure language and in manipulation of context files. *KMan*'s procedure language commands are shown in Figure 5. As in *dBASE II*, the procedures can be used along with the working, field, cell, and environmental variables (and the *KMan* functions and CALC commands) to form programs ranging in complexity from quick-and-dirty listings to full-blown accounting systems. Input and output forms are handled using the familiar AT, GET, and PUT statements from *dBASE II*, along with a few more exotic features such as the TALLY command, which enables the system to present the results of a user input on a related variable while the screen is still active. The user can play what-if right on the input form, rather than in a spreadsheet. Unlike *dBASE II*, *KMan* I/O forms reside in the working environment instead of waiting outside in a format file until called upon.

Having said all this, the only way I could get a handle on what was really going on with *KMan* was to form a mental image of a huge working environment. I call it the active *KMan* world. This world comprises the working variables (unlimited), the environment variables (they control system stuff), utility variables (the housekeepers), the cell variables, any forms that have been invoked, and the complete set of field variables that belong to the active record in the table (database file) in use. All of these variables are used as in any other structured programming language.

> Security and password control are the most elaborate I've seen on a micro-based system.

Context Files

Context files are the other key to *KMan*. They can be used to save and retrieve any or all combinations of the forms and variables used during a *KMan* session except, of course, fields stored in a table file.

Procedures that can nest to any level are stored in procedure files. By using procedures within procedures, context files can be called up to initialized, predefined variables, and tables (databases) can be opened and manipulated.

Additional Features

While forms and simple print instructions control most *KMan* output, CONVERT commands and environmental variables control output in specific formats for interchange between software—ASCII, BASIC data statement, and DIF are supported directly. *dBASE II* readable files are supported indirectly.

Security and password control are the most elaborate I've seen on a micro-based system. Each table, field, and spreadsheet cell can be assigned up to 26 read and 26 write user codes. Data tables are automatically encrypted and command files can be scrambled with a special utility. Initial access to the *KMan* system is restricted to authorized users with appropriate passwords. It's professional enough to discourage casual eavesdroppers and to give pause to more sophisticated snoopers.

All That Glitters

It would be impossible to write a program of this complexity that pleased everybody in all things and was bugless in its early versions. The authors of *KMan* did not manage to surprise us with the impossible.

The first four versions—all released within 4 months—did have bugs. In fact, version 1.04 had a monster. Every once in a while the system would simply crash. Version 1.05 got rid of that bug and seems to have rid itself of all the gremlins that feed on data.

While earlier versions were a bit on the pokey side, 1.05 is fast, especially when used with a machine with 256K RAM or more, and can give most comparable mini-based systems a good run for their money.

A few foibles remain—some that will be fixed in future versions, others that we'll just have to live with. When *KMan*

```
PERFORM          Invokes a procedure or command file
INCLUDE          Same as PERFORM
RETURN           Returns from current procedure
STOP             Stops all procedures
RELEASE          Releases variables or macros
LET              Assigns values to variables
WHILE-DO         Conditional loop
TEST-CASE        Value-based branching
IF-THEN-ELSE     Conditional branching
CONTINUE         Continue to the next iteration
BREAK            Leave WHILE-DO or TEST-CASE
WAIT             Wait for user input before processing
                  next command
SAVE             Save the present processing situation
                  on a context file
LOAD             Load a context file and resume processing
BYE              End interaction with KnowledgeMan
```

Figure 5: *Like* dBASE II, KnowledgeMan *has its own structured programming language. In addition to the commands listed above, all of* KMan*'s query language and form control commands can be used in a procedure.*

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WISING UP

loads into a system with a monochrome monitor, it automatically turns the intensity to full blast. For most of us this means fuzzy characters. *KMan* also uses a flashing block cursor and does not have the courtesy to return the system cursor when you end a *KMan* session.

It has operational quirks, too. When CREATING new records (similar to APPEND in *dBASE II*), the system gratuitously adds an extra record at each session. The user must follow a little routine in order to check for the extra blank record and delete it every time an update session ends.

Printer control is not as graceful or flexible as it should be. The ultimate answer may be a report writing utility, although MDBS says it has no plans for one.

Some of the programming requirements for generating menu-driven commands for casual users seem a bit complex, but future versions of the program may change this.

A sense of proportion helps in properly evaluating *KMan*. If your primary concern is manipulating complex databases, and you want to do a little spreadsheet work on the data contained therein, *KMan* could be just right for you. *KMan* is a remarkable piece of software, not wholly polished in version 1.05, but nevertheless a milestone in micro software design.

Clearly, I like the program, and I am willing to take the time to let my skills with it grow while its makers work out the kinks. That process should begin to happen in the first quarter of 1984, when MDBS is scheduled to introduce new utilities such as *Kpaint*, a forms-generating utility similar to *dBASE II*'s *ZIP*; *Ktext*, a full-screen editor; *Kgraph*, a screen and printer graphics generator similar to the Lotus *1-2-3* graphics package; and *Krun*, a run-time module.

All in all, Micro Data Base Systems has done a spectacular job in bringing mini-class performance and capability to the PC at a micro price. If you need that kind of power, *KnowledgeMan* is well worth the investment. ■

Getting Set For Real Time

With these instructions, a little electronic knowhow, and minimal cost, you can equip your PC with a real-time clock.

Every time you bring up DOS on your PC, you need to enter the date and time, remembering that the PC operates on a 24 hour clock (for instance, 2 p.m. is entered as 14:00, not 2:00). Now there's a way to side step this initialization process; you can install a real-time clock, a chip-sized component that you place on an integrated circuit chip. Once the clock is correctly set, it will ensure that the time and date given for a file update is accurate.

Unfortunately, real-time clocks have traditionally been part of multipurpose boards that cost several hundred dollars. Here, I'll present a cheaper alternative. What follows is a set of instructions that takes you step by step through the process of installing a real-time clock on the game control card of your IBM PC. You'll need a soldering iron and at least some electronics knowhow. In addition, you'll have to make two file changes.

Real-Time Clock

The heart of this project is a microprocessor real-time clock, which may be attached directly to the PC's address and data busses. This type of clock costs about $16. (See the *PC Technical Reference Manual*, pages 1-4, 2-8 through 2-12, 2-23, 2-121 through 2-126, and D-53.) In this case, I used the National Semiconductor MM58167A Microprocessor Compatible Real-Time Clock, although I am not recommending any particular product. The clock will not load the PC's bus, because the chip is a CMOS part. Incidentally, the PC's bus has some design margin—the design assumes two LS-TTL loads per socket, and the game card uses only one.

Mapping

The IBM PC uses only the least significant 10 bits (of 20) on the I/O bus, which means up to 512 I/O devices can be addressed. The PC's I/O map assigns each card a series of addresses. For example, the game card and its accessories are assigned addresses '200'X through '20F'X. The only one of these used is '201'X. We will assign address '203'X to the clock. By using this address, we can be sure that no other conforming attachments will conflict with this address, unless for some reason you installed a second, enhanced, game control card. This address is already conveniently available on the game card, specifically on the -Y1 output of module U1 (pin 14 of the 74LS138).

The clock chip has a chip select input, which designates when it has been selected, and five address inputs to select which of its registers is to be read or written (see Figure 1). We will use the higher order address bits. A10 through A14, to select these registers. This scheme, although a little awkward to describe or program,

results in economy of hardware: no logic circuitry is required beyond the clock circuit itself.

The clock chip contains RAM registers, which normally store an interrupt count. Since we will not be using the interrupt capability, we can use these RAM registers to store the year and a flag to increment the year.

A more detailed description of the MM58167A'a function may be found in the *National Semiconductor MM58167A Microprocessor Real Time Clock Data Sheet* (available from National Semiconductor, 2900 Semiconductor Dr., Santa Clara, CA 95051) or in *Everyone Can Know The Real Time*, by Steven A. Ciarcia, May 1982 (*BYTE* magazine pages 34 through 52).

Materials List

For this project you will need:

MM58167A integrated circuit soldering iron
24-pin IC socket
two 20-pF capacitors
220K resistor (220K is recommended, but I have used 100K successfully.)
27K resistor, and a 33K resistor, or any two resistors with 1.1 ratio.
two IN4148 diodes
one 32768-kHz crystal
3.2-volt lithium battery (shape not important)
Socket for the battery
0.1-μF disk capacitor (an electrolytic is *not* recommended—the leakage will drain the battery)
6 inches of 1/6-inch wide error correction tape (available from an office supply store)
electrical tape

Assembly

This project requires some soldering skills and familiarity with electronic components. If you do not have these skills, enlist the aid of a friend and use this opportunity to acquire them.

In this project you mount all components on the component side of the card (see Figure 2); connecting wires are on the pin side of the card (see Figure 3). Do not mount components on the pin side. In several cases, you must insert more than one component lead through the same hole to avoid later interconnection. Do not solder a connection until told to do so.

Remove the game card from the PC. You may find it easiest to work on when the tail of the black metal mounting tab is held in a vise. It is a good idea to cover the gold card tabs with masking tape so they don't get splashed with solder. If you have a solder-sucking tool, the job will be somewhat easier. You can remove the solder from the row of plated-through holes (PTHs) at the bottom edge of the card at this point. Occasionally during the soldering process the plastic conformal coating on the card may scorch. This scorching is unsightly, but it is certainly not harmful. The actual procedure for installing the real-time clock is described as follows.

1. Place two strips of the 1/6-inch correction tape to mark the grid shown in Figure 3. They should be just above, and just to the left, of the prototype area. Number them as shown.
2. Insert the module socket from the component side, with corner pins at A9 and L3 (see Figure 4). If the socket has an indicator for pin 1, this should be at L3. Solder the socket in place using pin 13 (grid A3).
3. Locate module U1. This is the 74LS138 closest to the prototype area (there are two). Tack solder a wire to pin 14 of this module, on the pin side. This pin is nearest to grid B10. You may have to lift the label tape slightly to do so. Place the other end of this wire in the PTH (plated through hole) of pin 1 of the new socket, and solder the wire and sock-

Address	Function
0203	Counter–ten thousandths of seconds
0603	Counter–hundredths and tenths of seconds
0A03	Counter–seconds
0E03	Counter–minutes
1203	Counter–hours
1603	Counter–day of week
1A03	Counter–day of month
1E03	Counter–month
2203	RAM–ten thousandths of seconds
2603	RAM–hundredths and tenths of seconds
2A03	RAM–seconds
2E03	RAM–minutes
3203	RAM–hours
3603	RAM–day of week
3A03	RAM–day of month
3E03	RAM–month
4203	Interrupt Status Register
4603	Interrupt Control Register
4A03	Count Reset
4E03	RAM Reset
5203	Status bit
5603	Go command
5A03	Standby Interrupt
7E03	Test mode

Figure 1: *Register map of the MM58167A.*

et into place (grid L3).

4. Insert a 20-pF capacitor at grid C1-C2. Insert the 32.768-kHz crystal at grid C2-B2. Bend the crystal lead at C2 and insert it at grid C3, alongside IC socket pin 10. Solder C1, C2, and C3. (C1 has only a capacitor lead, C2 has a capacitor lead and a crystal lead. C3 is connected to C2.) It is a good idea to draw heat from the crystal while soldering it by placing a small clip to act as a heatsink on the component side lead.
5. Insert the other 20-pF capacitor at grid B1-B2. Solder the B1 end. (B1 has only a capacitor lead. B2 has a capacitor lead and a crystal lead.)
6. Bend the leads on the 220K-ohm resistor, insert it at grid D2-I2 and solder. Do not clip the leads yet. Using light gauge wire, connect one end of the resistor to IC socket pin 11, and solder (grid B3). Using light gauge wire, solder the other end of the resistor to the two wires at grid B2. Again, use a heatsink on the crystal lead. Trim the leads at B1, B2, C1, C2, D2, and I2.
7. Bend the diode leads for insertion. It is a good idea to bend the leads on glass diodes while holding the lead near the body with long-nosed pliers. This measure prevents the glass from breaking where the lead exits. Insert the leads from the banded (anode) end of both diodes into grid M9. The cathode lead of one diode goes at grid R10; the other cathode lead goes at grid R9. Insert the 0.1-μF capacitor at grid M1-M9. Solder at M1. Shorten and bend one lead from M9 and insert alongside IC socket pin 24 (grid L9). Use a heatsink on both diodes. Solder M9, L9, and R10, trim the capacitor lead and the other diode lead at M9, and the lead at R10.
8. Using light gauge stranded wire, solder a 1-inch piece to each contact of the battery holder. On cylindrical batteries the small diameter is the negative contact; the large diameter is the positive contact. Solder the other end of the negative lead at grid T1. This lead enters from the component side of the board.

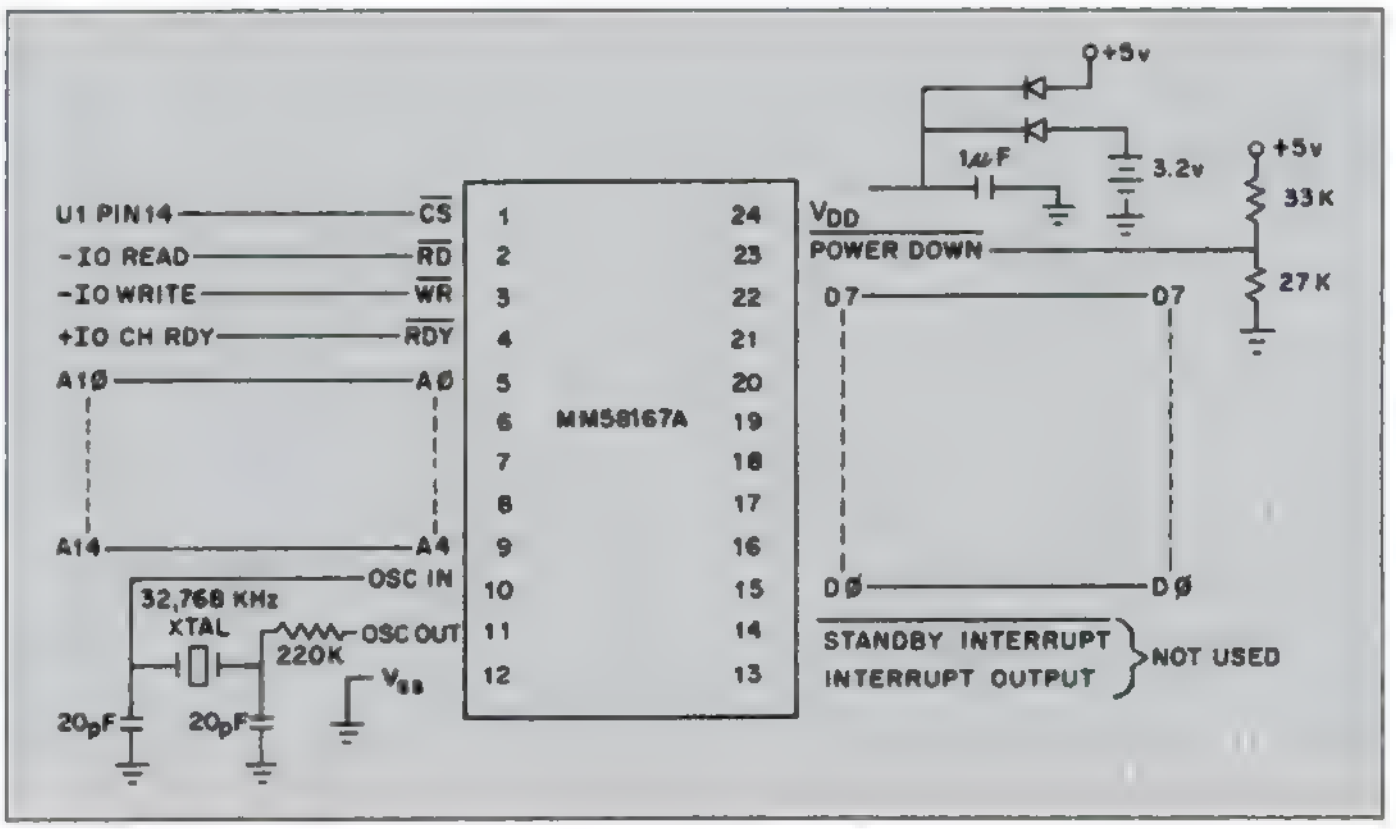

Figure 2: *Schematic diagram of the component side of the game control card. (Copyright 1983 LV Marks.)*

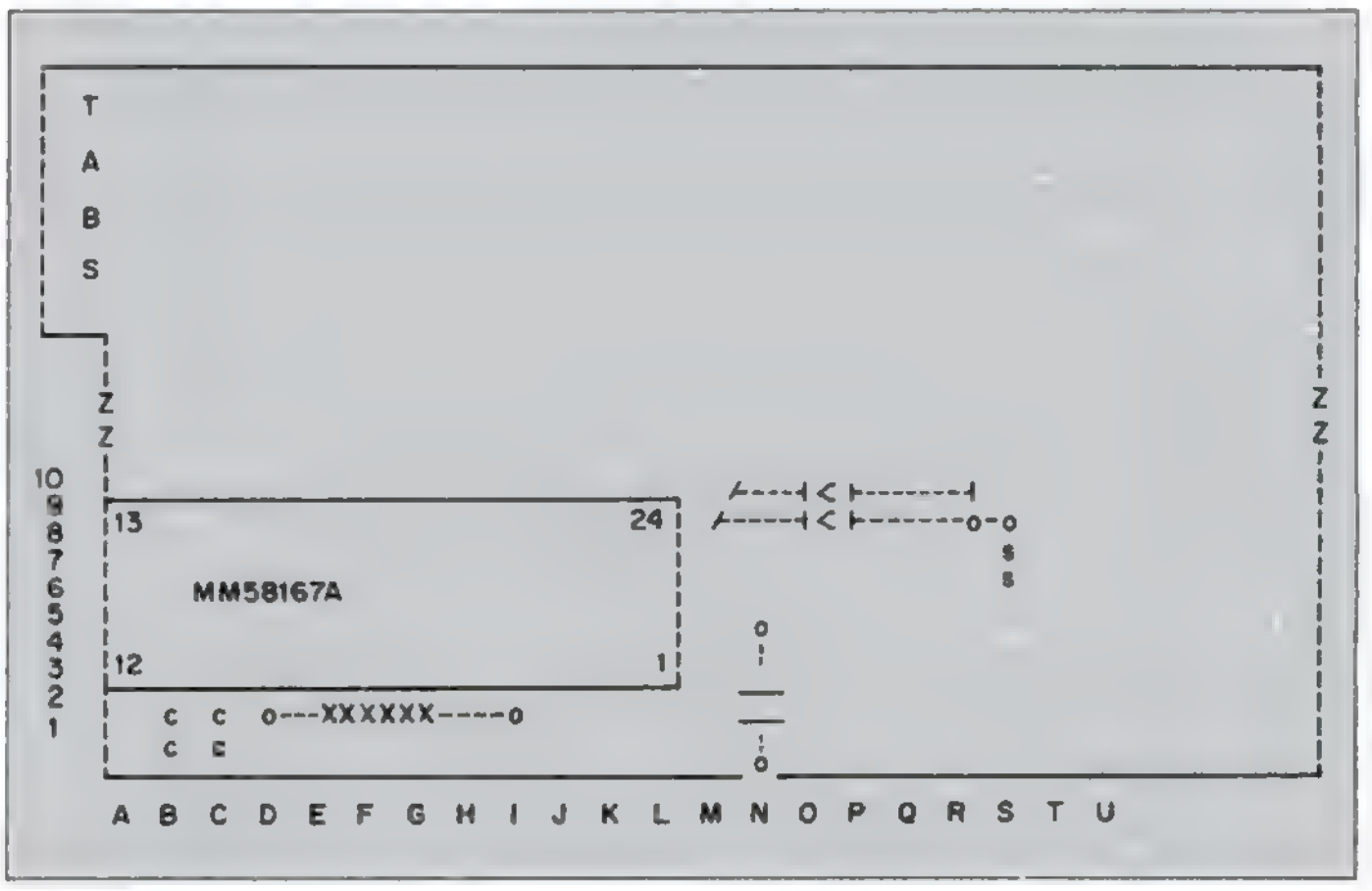

Figure 3: *A pictorial layout of the other connections, viewed from the pin side. You are looking through the card at the components. The drawing is also marked for use as a grid. All of row 10 is connected to +5 volts. All of row 1 is ground.*

Insert the other end of the positive lead into grid S9 from the component side of the board. Join it to the diode lead at R9, solder and trim the leads. Use a heatsink on the diode. Tie the battery holder to the card with wire through U5 and V5, around the holder's waist. If you use a coin-shaped battery instead of a cylindrical one, your mounting position will vary.

9. Two resistors are used for this step, with a ratio of 1.1 to 1. I used 27K and 33K. Bend the leads on both resistors. Insert the larger one at grid S10-S5. Solder at S10. Insert the smaller one at grid R1-R6. Solder at R1. Using light gauge hookup wire, insert one end alongside IC socket pin 23 (grid K9) and solder. Connect the other end to the resistor leads at S5 and R6; solder

and trim the leads at S10, S5, R6, and R1.

10. Using light gauge hookup wire, connect IC socket pin 12 (grid A3) to ground (grid A1).
11. Using light gauge hookup wire, make the bus connections as shown in Figure 4 to IC socket pins 2 through 9 and 15 through 22. The last connection in Figure 4, *chip select* (CS) you already made in step 3. Insert a wire alongside each pin and solder. Place the other end through the PTH at the card tab, and solder from the component side. (If you were not able to clear the PTHs beforehand, heat from the pin side as you push the wire through.) It's best to do the short wires first (socket pins 15 through 22) and then the long ones (pins 2-9). Check carefully to assure that solder is not bridged between two points. At this point the only unconnected IC pins should be 13 and 14 (grid A9 and B9). These are the two interrupt lines that are not used.
12. Remove the tape from the card tabs. Use an ohmmeter to check for short circuits. Values below 50 ohms are unacceptable. Place one lead on the tab B1 (the ground). The only tab that should conduct to B1 is B31. Place one lead on the tab B3 (+5 volts). The only tab which should conduct to B3 is B29. If it shorts, check for solder bridging. The easiest way to remove a solder bridge is to hold the card upside down above the soldering iron and let the solder run onto the iron tip.
13. If the test is successful, remove the PC's cover. Ground yourself to remove static charges by touching a metal part of the PC's case, or some other grounded appliance. Remove the IC from the conductive foam and plug it in. Place one row of pins lightly into the socket. Make sure IC pin 1 (it has a dimple near it) is in socket pin 1 (grid L3). The other row will rest above the socket. Press evenly from the side on all of them with a grounded credit card, while you press down on the chip. All 24 pins should enter the socket. Check to make sure that none has buckled under. Insert the battery in its socket. Finally, wrap the battery's metal case with electrical tape to ensure that it doesn't short against anything. *Important: Once you have inserted the battery, do not place the circuit card on any conductive surface, or you will short-circuit the battery.*

I/O Channel		MM58167A		
Tab	Name	Grid	Pin	Name
A2	D7	J9	22	D7
A3	D6	I9	21	D6
A4	D5	H9	20	D5
A5	D4	G9	19	D4
A6	D3	F9	18	D3
A7	D2	E9	17	D2
A8	D1	D9	16	D1
A9	D0	C9	15	D0
A17	A14	D3	9	A4
A18	A13	E3	8	A3
A19	A12	F3	7	A2
A20	A11	G3	6	A1
A21	A10	H3	5	A0
A10	+I/O Ch Rdy	I3	4	-RDY
B13	-IOW	J3	3	-WR
B14	-IOR	K3	2	-RD
Pin 14 of U1		L3	1	-CS

Figure 4: *Bus connections for the MM58167A.*

File Changes

14. Plug the card into the PC. To transfer the information from the newly installed battery-operated clock to the PC's clock, you will need to make two file changes. These files are an Autoexec file, and a Com file, which is called by the Autoexec file to transfer the data. For example, to modify a *VisiCalc* diskette, the Autoexec.batfile, which currently reads:

```
date
time
vc80.com,
```

must be edited to read:

```
Copyclk
vc80.com
```

and the program Copyclk.com (which follows the text) must be copied to the *VisiCalc* diskette. No modifications to system software are required.

The additional program listings that follow the Copyclk program may be used to check the clock function. The Textcloc.k and Test RAM.BAS are BASIC programs you can use to exercise and experiment with the clock chip. The Setclk.com program can be used to copy

the PC's timer into the battery clock. For example, when daylight saving time goes into effect, use the DOS TIME command to update the time. Enter Setclk to update the battery clock to match. Also, the DOS DATE command may be used to correct for leap years. Where you enter BASIC immediately after booting, the Mergeclk.BAS program may be merged with the first file to be run (for example, the program that reassigns your function keys), to set the PC's clock, in place of Copyclk.

```
;MAKE SURE THE PRINTER IS IN 96 OR 132 COLUMN MODE TO PRINT THE ASSEMBLY
; COPYRIGHT (C) 1983 LAURENCE V. HARRIS
        TITLE   COPYCLK
        PAGE    255,96
        NAME    BATCLK
ONESEG          SEGMENT
                ASSUME CS:ONESEG,DS:ONESEG,SS:ONESEG
        ORG     100H
HERE:
        JMP     SHORT   BEGIN100
;=============================================================;
;       DATA AREA                                             ;
;=============================================================;
CR      EQU     0DH
LF      EQU     0AH
; SHOULD BE ABLE TO DO ERROR, TIME, AND DATE AS A STRUCTURE
THREE   DB      03H
TEN     DB      0AH
HUNDRED DB      100D
DAYS    DB      'SUNMONTUEWEDTHUFRISAT'
ERR     DB      ' ERROR',CR,LF
TIME    DB      'TIME - HH.MM:SS.SS',CR,LF
                ;HOURS ARE TIME[7,8], MIN[10,11], SEC ARE [13,14]
DATE    DB      'DATE - DAY MM/DD/YYYY',CR,LF,'$'
                ; DAY IS DATE[7] MM[11],DD[14],YY[17]
BEGIN100:
        CLD
RESTART:
;=============================================================;
;       COPY THE DATE                                         ;
;=============================================================;
;=============================================================;
;       DAY-OF-WEEK                                           ;
;=============================================================;
        MOV     DX,1A03H
        IN      AL,DX
        DEC     AL
        MUL     THREE
        LEA     SI,DAYS
        XOR     AH,AH
        ADD     SI,AX
        LEA     DI,DATE[7]
        MOV     CX,3
REP     MOVSB
;=============================================================;
;       MONTH                                                 ;
;=============================================================;
        INC     DI              ; JUMP OVER THE PUNCTUATION
        MOV     DX,1E03H
        CALL    BCD_HEX
        MOV     BH,AL
;=============================================================;
;       PERFORM A SET OF TESTS TO INCREMENT YEAR  ;
;=============================================================;
        MOV     CX,####
        MOV     DX,2203H        ; USE THE 1ST NIBBLE, 2203H
        CMP     BH,12D          ; SET FLAG IN DEC. (NO=12)?
        JNZ     JAN             ; WASN'T DEC.
        MOV     AL,0F0H
        OUT     DX,AL           ; ALWAYS PUT IN F0 IN DEC.
JAN:    CMP     BH,1D           ; TEST FLAG IN JAN. (NO=1?)
        JNZ     DAY             ; WASN'T JAN.
        IN      AL,DX           ; WAS IT FIRST TIME IN JAN?
        CMP     AL,0F0H
        JNZ     DAY             ; WASN'T 1ST TIME IN JAN
        XOR     AL,AL           ; WAS THE FIRST TIME IN JAN.
        OUT     DX,AL           ; RESET THE FLAG
        ADD     DX,CX           ; HIGH PART OF YEAR, 2403H
        IN      AL,DX
        MOV     AH,AL
        ADD     DX,CX           ; LOW PART OF YEAR, 2A03H
        IN      AL,DX
        INC     AL              ; ADD 1 FOR NEXT YEAR
        OUT     DX,AL           ; STORE LOW PART
        SUB     DX,CX           ; 2803H
        MOV     AL,AH
        OUT     DX,AL           ; STORE HIGH PART
;=============================================================;
;       DAY                                                   ;
;=============================================================;
DAY:    MOV     DX,1A03H
        CALL    BCD_HEX
        MOV     BL,AL
        MOV     SI,BX           ; PARK DAY AND MONTH IN SI
;=============================================================;
;       YEAR    HUNDREDS                                      ;
;=============================================================;
        MOV     DX,2403H
        CALL    BCD_HEX
        MUL     HUNDRED         ; SHOULD BE FA BYTE THAT IS MULTIPLIED
        MOV     BX,AX           ; HEX NUMBER OF HUNDREDS
        DEC     SI              ; REDUCE BY ONE
;=============================================================;
;       YEAR    TENS AND UNITS                                ;
;=============================================================;
        MOV     DX,2403H
        CALL    BCD_HEX
        ADD     BX,AX
;=============================================================;
;       LOAD THE DATE                                         ;
;=============================================================;
        MOV     DX,SI           ; GET MONTH AND DAY BACK
        MOV     CX,BX           ; GET YEAR PARTS BACK
        MOV     AH,2BH
        INT     21H
        MOV     AH,AL
        MOV     BP,AX           ; SAVE ERROR STATUS IN BP
                                ; 00=OK, FF=NO
        MOV     CH,0            ; REQUIRED FOR SUBROUTINE
;=============================================================;
;       COPY THE TIME                                         ;
;=============================================================;
;=============================================================;
;       HOURS                                                 ;
;=============================================================;
        MOV     DX,1203H
        LEA     DI,TIME[7]
        CALL    BCD_HEX
        MOV     BH,AL
;=============================================================;
;       MINUTES                                               ;
;=============================================================;
        MOV     DX,0E03H
        CALL    BCD_HEX
        MOV     BL,AL
        MOV     SI,BX           ; PARK HOURS AND MINUTES IN SI
;=============================================================;
;       SECONDS                                               ;
;=============================================================;
        MOV     DX,0A03H
        CALL    BCD_HEX
        MOV     BH,AL
;=============================================================;
;       1/100 SECONDS                                         ;
;=============================================================;
        MOV     DX,0803H
        CALL    BCD_HEX
        MOV     BL,AL
;=============================================================;
;       LOAD THE TIME                                         ;
;=============================================================;
        MOV     CX,SI           ; GET HOURS AND MINUTES BACK
        MOV     DX,BX           ; GET SECONDS AND 1/100 BACK
        MOV     AH,2DH
        INT     21H
        MOV     AH,AL
        OR      BP,AX           ; CHECK FOR TIME OR DATE ERROR
        LEA     DX,ERR          ; ALWAYS LOAD THE ERROR ADDRESS
        JNZ     NRT             ; RELOAD TO GOOD ADDRESS IF OK
;=============================================================;
;       TIME & DATE WERE OK                                   ;
;=============================================================;
        LEA     DX,TIME
```

```
;=============================================================;
;       PUT TIME AND DATE ON THE SCREEN                       ;
;=============================================================;
WRT:    MOV     AH,9
        INT     21H
        INT     20H             ; RETURN TO DOS
;=============================================================;
;       CONVERT TWO BCD DIGITS TO A HEX BYTE:                 ;
;               RECEIVES  BCD DIGITS IN AL                    ;
;               RETURNS  COMPOSITE HEX DIGIT IN AL            ;
;               DESTROYS CX, AX (AX ALWAYS = 0)               ;
;=============================================================;
BCD_HEX         PROC NEAR
RETRY: IN       AL,DX
        MOV     AH,AL           ; COPY  AND SAVE DIGITS
        MOV     CX,DX           ; SAVE THE READ ADDRESS
        MOV     DX,5203H        ; ROLLOVER FLAG ADDRESS
        IN      AL,DX           ; GET ROLLOVER FLAG
        OR      AL,AL           ; TEST
        JZ      OK              ; 0=OK, FF=NG
        MOV     DX,CX           ; RESTORE READ ADRESS
        JMP     SHORT   RETRY
OK:     MOV     AL,AH           ; RESTORE DIGITS
        MOV     CL,04           ; SET SHIFT COUNT TO 4 (BH=0)
        SHR     AL,CL           ; GET THE TENS IN AL
        AND     AH,0FH          ; GET THE ONES IN AH
        OR      AX,3030H        ; CONVERT TO ASCII
        STOSW                   ; STORE DIGITS IN STRING
        INC     DI              ; JUMP OVER THE PUNCTUATION
        AND     AX,0F0FH        ; BACK TO TWO BCD DIGITS
        MOV     CL,AH           ; SAVE THE UNITS IN CL
        XOR     AH,AH           ;
        MUL     TEN             ; SHOULD BE F6 BYTE MUL
        ADD     AL,CL
        RET                     ; END OF BCD_HEX ROUTINE
BCD_HEX ENDP
ONESEG          ENDS
        END     HERE

;MAKE SURE THE PRINTER IS IN 96 OR 132 COLUMN MODE TO PRINT THE ASSEMBLY.
; COPYRIGHT (C) 1983 LAURENCE V. MARKS
        TITLE   SETCLK
        PAGE    255,96
        NAME    BATCLK
ONESEG          SEGMENT
                ASSUME CS:ONESEG,DS:ONESEG,SS:ONESEG
        ORG     100H
HERE:
        JMP     SHORT   BEGIN100
;=============================================================;
;       DATA AREA                                             ;
;=============================================================;
CR      EQU     0DH
LF      EQU     0AH
TEN     DB      10D
HUNDRED DB      100D
MSG     DB      'MAKE SURE DOS TIME AND DATE RAN FIRST.'
DAYS    DB      CR,LF,'ENTERTHE DAY OF THE WEEK.SUN=1, MON=2...SAT=7.',"$"
BEGIN100:
;=============================================================;
;       COPY THE TIME TO BATTERY CLOCK                        ;
;=============================================================;
        MOV     BP,400H
;=============================================================;
;       GET THE TIME FROM DOS                                 ;
;=============================================================;
        MOV     AH,2CH
        INT     21H
        MOV     BX,DX           ; NEED DX FOR OUT
        MOV     DX,0A03H        ; HUNDREDTHS ADDRESS
;=============================================================;
;       HUNDREDTHS OF SECONDS                                 ;
;=============================================================;
        MOV     AL,BL
        CALL    HEX_BCD
        OUT     DX,AL           ; 0603H
;=============================================================;
;       SECONDS                                               ;
;=============================================================;
        ADD     DX,BP           ; POINT TO NEXT TIMER ADDRESS
        MOV     AL,BH
        CALL    HEX_BCD
        OUT     DX,AL           ; 0A03H
;=============================================================;
;       MINUTES                                               ;
;=============================================================;
        ADD     DX,BP           ; POINT TO NEXT TIMER ADDRESS
        MOV     AL,CL
        CALL    HEX_BCD
        OUT     DX,AL           ; 0E03H
;=============================================================;
;       HOURS                                                 ;
;=============================================================;
        ADD     DX,BP           ; POINT TO NEXT TIMER ADDRESS
        MOV     AL,CH
        CALL    HEX_BCD
        OUT     DX,AL           ; 1203H
;=============================================================;
;       WRITE THE MESSAGE AND SOLICIT THE WEEKDAY             ;
;=============================================================;
        ADD     DX,BP           ; POINT TO NEXT TIMER ADDRESS
        MOV     SI,DX           ; SAVE NEXT ADDRESS IN SI
        LEA     DX,MSG
RETRY:  MOV     AH,09H
        INT     21H
        MOV     AH,01H          ; GET A SINGLE CHARACTER
        INT     21H
        SUB     AL,30H
        CMP     AL,1H
        JS      ERR             ; VALUE ENTERED < 1
        CMP     AL,7H
        JBE     SET_DAY         ; VALUE ENTERED < 8
ERR:    LEA     DX,DAYS
        JMP     SHORT   RETRY
SET_DAY:
        MOV     DX,SI
        OUT     DX,AL           ; 1603H
;=============================================================;
;       GET THE DATE FROM DOS                                 ;
;=============================================================;
        MOV     AH,2AH
        INT     21H
        MOV     BX,DX           ; NEED BX FOR OUT
        MOV     DX,SI
;=============================================================;
;       DAY OF MONTH                                          ;
;=============================================================;
        ADD     DX,BP           ; POINT TO NEXT TIMER ADDRESS
        MOV     AL,BL
        CALL    HEX_BCD
        OUT     DX,AL           ; 1A03H
;=============================================================;
;       MONTH                                                 ;
;=============================================================;
        ADD     DX,BP           ; POINT TO NEXT TIMER ADDRESS
        MOV     AL,BH
        CALL    HEX_BCD
        OUT     DX,AL           ; 1E03H
;=============================================================;
;       YEAR  CLEAR THE CARRY FLAG                            ;
;=============================================================;
        ADD     DX,BP           ; POINT TO NEXT TIMER ADDRESS
        XOR     AL,AL
        OUT     DX,AL           ; 2203H
;=============================================================;
;       YEAR  SEPARATE THE SINGLE HEX WORD IN CX              ;
;=============================================================;
        MOV     AX,CX
        DIV     HUNDRED         ; HUNDREDS IN AL, ONES IN AH
;=============================================================;
;       YEAR, THE HUNDREDS PART                               ;
;=============================================================;
        ADD     DX,BP           ; POINT TO NEXT TIMER ADDRESS
        MOV     BH,AH           ; SAVE THE ONES
        CALL    HEX_BCD
        OUT     DX,AL           ; 2603H
;=============================================================;
;       YEAR, THE ONES PART                                   ;
;=============================================================;
        ADD     DX,BP           ; POINT TO NEXT TIMER ADDRESS
        MOV     AL,BH
        CALL    HEX_BCD
        OUT     DX,AL           ; 2A03H
;=============================================================;
;       RETURN TO DOS                                         ;
;=============================================================;
        INT     20H             ; RETURN TO DOS
```

```
;=============================================================;
;      CONVERT A HEX BYTE TO TWO BCD DIGITS IN A BYTE         ;
;               RECEIVES HEX BYTE IN AL                       ;
;               RETURNS BCD DIGITS IN AL                      ;
;               AH DESTROYED. ALL OTHERS PRESERVED            ;
;=============================================================;
HEX_BCD         PROC NEAR
        XOR     AH,AH           ; CLEAR AH
        DIV     TEN             ; DIVIDE BY TEN. TENS IN AL
        SHL     AL,1            ; AND ONES IN AH
        SHL     AL,1            ;
        SHL     AL,1            ;
        SHL     AL,1            ; MUL   AH,16D
        ADD     AL,AH           ;
        RET                     ; END OF HEX_BCD ROUTINE
HEX_BCD ENDP
ONESEG          ENDS
        END     HERE
```

```
10 REM COPYRIGHT (C) 1983 LAURENCE V  MARKS
20 REM THIS IS TESTCLOC.K   IT MAY BE USED TO EXPERIMENT WITH
   THE BATTERY CLOCK
30 DEFINT A-Z
40 DEF FNH$(I)=RIGHT$("0"+HEX$(INP(I)),2)
50 DEF FNO(A)=(16*INT(A/10))+(A-(10*INT(A/10)))
60 CLS
70 PRINT "ENTER MENU SELECTION."
80 PRINT "      S....SET SECONDS"
90 PRINT "      M....SET MINUTES"
100 PRINT "      H....SET HOURS"
110 PRINT "      W....SET DAY OF WEEK"
120 PRINT "      D....SET DAY OF MONTH"
130 PRINT "      N....SET MONTH"
140 PRINT "      T....READ TIME"
150 PRINT "      Y....READ DATE"
160 PRINT "      L....LOOP READING TIME"
170 PRINT "      X....XFER TIME TO PC-TIMER"
180 PRINT "      C....CLEAR TIMER"
190 PRINT "      B    .EXIT TO BASIC"
200 PRINT "      @....EXIT TO DOS"
210 ON INSTR("@$SMMHHWWDDNNTTYYLLXXCC8888",INKEY$)GOTO
    210,230,230,240,240,250,250,260,260,270,270,280,280,290,
    290,300,300,310,310,320,320,330,330,340,340,350,350
220 BEEP GOTO 210
230 LOCATE 18,5 INPUT,"SECONDS",S:OUT &HA03,FNO(S)
    LOCATE 18,5 PRINT SPC(30) GOTO 210
240 LOCATE 18,5 INPUT;"MINUTES",S:OUT &HE03,FNO(S)
    LOCATE 18,5 PRINT SPC(30) GOTO 210
250 LOCATE 18,5 INPUT,"HOURS";S:OUT &H1203,FNO(S):
    LOCATE 18,5 PRINT SPC(30) GOTO 210
260 LOCATE 18,5:INPUT;"WEEK DAY";S:OUT &H1603,FNO(S).
    LOCATE 18,5 PRINT SPC(30) GOTO 210
270 LOCATE 18,5 INPUT;"DAY OF MONTH";S:OUT &H1A03,FNO(S):
    LOCATE 18,5:PRINT SPC(30) GOTO 210
280 LOCATE 18,5 INPUT,"MONTH",S OUT &H1E03,FNO(S)
    LOCATE 18,5 PRINT SPC(30) GOTO 210
290 LOCATE 18,5 PRINT "TIME (HH MM SS)=",FNH$(&H1203);":";
    FNH$(&HE03);" ",FNH$(&HA03) WHILE INKEY$="" WEND
    LOCATE 18,5 PRINT SPC(30) GOTO 210
300 LOCATE 18,5 PRINT "DATE (WEEKDAY--MONTH--DAY)=";
    FNH$(&H1603),"--",FNH$(&H1E03),"--",FNH$(&H1A03)
    WHILE INKEY$="" WEND LOCATE 18,5:PRINT SPC(40) GOTO 210
310 LOCATE 18,5 PRINT "TIME (HH MM SS)=",FNH$(&H1203);":";
    FNH$(&HE03);":";FNH$(&HA03);.IF INKEY$="" THEN 310
    ELSE LOCATE 18,5 PRINT SPC(30) GOTO 210
320 TIME$=FNH$(&H1203)+":"+FNH$(&HE03)+":"+FNH$(&HA03):
    GOTO 210
330 OUT &H4A03,255:GOTO 210
340 END
350 SYSTEM
```

```
10 REM COPYRIGHT (C) 1983 LAURENCE V. MARKS
20 REM THIS IS MERGECLK BAS  IT MAY BE USED TO COPY THE TIME
   AND DATE TO THE PC'S TIMER FROM BASIC OR BASICA.
30 '-----------------------------------------------
40 '  PUT YOUR KEY REASSIGNMENTS HERE
50 '-----------------------------------------------
60 KEY OFF CLS
70 DEF FNT$(I)=RIGHT$("0"+HEX$(INP(I)),2)
80 TIME$=FNT$(&H1203)+":"+FNT$(&HE03)+":"+FNT$(&HA03)
90 DATE$=FNT$(&H1E03)+"-"+FNT$(&H1A03)+"-"+FNT$(&H2A03)
   +FNT$(&H2A03)
100 LOCATE 5,35 PRINT "HI THERE!"
110 LOCATE 11,33 PRINT "ON ",DATE$;" "
120 WHILE INKEY$=""
130 T$=TIME$
140 MID$(T$,1,2)=STR$(VAL(LEFT$(T$,2))MOD 12) 'OMIT THIS LINE
    FOR MILITARY TIME
150 LOCATE 8,33,0 PRINT "IT'S ";T$
160 WEND
170 KEY ON CLS:NEW
```

```
10 REM COPYRIGHT (C) 1983 LAURENCE V. MARKS
20 REM THIS IS TESTRAM BAS  IT MAY BE USED TO EXPERIMENT
   WITH THE BATTERY-MAINTAINED RAM IN THE CLOCK.  THE FIRST
   AND FIFTH LOCATIONS ARE NIBBLES ONLY
30 CLS
40 PRINT "ENTER CODE DESIRED..."
50 PRINT "S... SET 8 RAM LOCATIONS"
60 PRINT "R... READ 8 RAM LOCATIONS"
70 PRINT "L....LOOP READING 8 RAM LOCATIONS"
80 PRINT "C....CLEAR 8 RAM LOCATIONS"
90 PRINT "B....EXIT TO BASIC"
100 PRINT "@....EXIT TO DOS"
110 ON INSTR("@SSRRLLCC8888",INKEY$)GOTO 110,130,130,160,160,
    150,150,160,160,170,170,180,180
120 BEEP GOTO 110
130 LOCATE 12,1:FOR I=&H2203 TO &H3E03 STEP &H400.
    PRINT"VALUE FOR LOCATION ";HEX$(I)::INPUT J OUT I,J:
    NEXT I GOTO 30
140 LOCATE 12,1:FOR I=&H2203 TO &H3E03 STEP &H400.
    PRINT"VALUE FOR LOCATION ",HEX$(I)," ";INP(I) NEXT I
    WHILE INKEY$="" WEND GOTO 30
150 LOCATE 12,1:FOR I=&H2203 TO &H3E03 STEP &H400:
    PRINT"VALUE FOR LOCATION ";HEX$(I);" ";INP(I):NEXT I:
    IF INKEY$="" THEN 150 ELSE 30
160 OUT &H4E03,255 GOTO 110
170 END
180 SYSTEM
```

APPLICATIONS/SCOTT KARIYA

PCs Polish A PR Firm's Image

At Ruder, Finn & Rotman, a large New York City public relations organization, everyone, from the chairman of the board to the administrative assistants, is using PCs.

Illustration: Dave Calver

When you walk into the main reception area of the New York headquarters of Ruder, Finn & Rotman (RF&R), you might think you have mistakenly entered the lobby of the Museum of Modern Art. Life-sized mannequin sculptures and handsome black and white photographs impart an atmosphere of cultural sophistication. As you pass through the lobby's rich wooden doors and enter the offices, however, the decor changes. The clean lines of IBM PCs replace the lobby's free-form sculptures. The mood here is one of technical innovation. And so it should be: RF&R is one of the most computerized public relations firms in the industry.

If RF&R produces a tangible product, it is the vast quantity of written material that it creates. These materials—news releases, speeches, articles, brochures, annual reports, and radio and TV commercial scripts—are approved by clients and then released to the masses via print or broadcast media.

"If you want to oversimplify the role of an organization such as this," says Felix Kaufman, executive vice-president and director of RF&R's PC implementation strategy, "it strives to help its clients express themselves effectively in public—explain their policies, their values, their goals. This may involve interfacing with the media, with government officials, with the public. It can be part of a marketing function or investor relations, or it can relate to some public-spirited activity."

The emphasis on written material is one reason that, unlike many other companies, there is an IBM typewriter on virtually every executive's desk, from senior management on down. And now, PCs are beginning to join those typewriters.

Not Just for Secretaries

Word processing is the dominant application for the PCs at RF&R. "Because of the limited availability of time on the PC," secretaries are the most frequent users of the PCs for word processing applications, according to Gail Safian, director of the Health Care Communication Division. Nevertheless, RF&R does not consider word processing merely a secretarial function. "Executives spend whatever time they can get on the machine," Safian adds. "You see them coming in at 8 a.m. just so they can use it." This growing interest and use of the

PCs by RF&R's executives distinguishes the firm's implementation of word processing from that of other businesses.

"In the word processing game, I divide people into 'starters' and 'finishers,' " says Felix Kaufman. "My definition of a starter is a person on the professional staff who can type, either hunt and peck or otherwise, and who, therefore, is not repulsed by a keyboard as are so many executives in industry. Starters prepare copy that a finisher has to clean up." There are many starters at RF&R, including Chairman of the Board, David Finn.

Few chief executive officers of large corporations have PCs in their offices. But David Finn is no ordinary CEO. He is an avid art lover, particularly of sculpture. Pictorial essays on Henry Moore crowd the reference manuals on business management on his bookshelves. Yet, sitting on a credenza within fingertip reach from his desk, is an IBM PC. Finn was the first executive at RF&R to get one. A prolific writer, he has authored many books on sculpture and has written a series of articles profiling American CEOs for the *Harvard Business Review*. Finn says the PC helps him get more things done. He now does all his writing on his PC. And although he has two secretaries, Finn does not object to sitting at the PC keyboard. "It's not really typing, it's writing," he claims. Moreover, he considers the repetition of dictation/transcription inefficient for the organization as a whole and somewhat belittling to the secretary. Says Finn, "I think the traditional executive–secretary/assistant relationship will probably undergo a fundamental change in the next generation. I can see that the PC will change that whole setup."

Six months ago, Gail Safian's Health Care Communication Division (an account group comprised of four executives and four administrative support personnel) received its first PC. Now she wants more. "It has been so successful that the big problem is getting time on it," she says. "We now have to schedule usage time. Everybody wants to use it." The PC and *WordStar* have significantly reduced the time needed to prepare text.

The lone PC that supports her group sits in a corner near the secretaries' desks. This makes sense, Safian says, because of the amount of revision that needs to be done on the written material coming from the executives. Revisions caused by further client consultation or schedule changes used to require retyping over and over again on electric typewriters; now they can be completed in a few moments. With deadlines always looming, Safian's group has come to rely on the speed and flexibility of electronic editing.

Inside and Out

RF&R is also testing several other applications. Several account groups now do forecasts using *MultiPlan*. Another department is experimenting with a client-prospecting package from Condor. PCs speed up the creation of client proposals, press releases, and financial statements. Another application, just now being implemented, extends the power of PCs beyond the internal operations of RF&R:

It uses the PC's electronic transmission capabilities to transmit documents to and from clients. Bernard Mogelever heads a group that services several high-tech companies. Using special software, his group recently began transmitting electronic mail to a PC located in General Electric Information Services' Rockville, Maryland, headquarters. Messages and large documents can be sent and revised by either side in seconds. Facsimile, the only comparable transmission mode, is slower and does not allow for changes. Mogelever sees this new medium supplementing, not replacing, traditional forms of communications. Legal documents, for example, must still be sent as hard copy by mail or overnight carrier. However, PC transmission is ideal for certain communications, particularly urgent ones. And, states Mogelever, "public relations firms, being communications-oriented companies, have a responsibility to explore all alternatives in order to best serve client interests."

Some of RF&R's PC applications are less text-oriented. In the Accounting Department, Abe Peritz, the controller/treasurer, marvels at how much he can do with *VisiCalc*. He uses the spreadsheet's formatting capabilities to generate financial statements, budgets, projections, and other management reports. For his regular reports to higher management, he simply calls up the spreadsheet shell that contains the columns, headings, and line totals that he created several months before and enters the correct data. At the touch of a button, the spreadsheet instantly recalculates new bottom-line totals. Ready-to-distribute copies come off his Epson MX-100 printer in seconds. Peritz reports tremendous time savings. By his estimate, what once took his staff 80 man-hours is now done in 20. Moreover, last-minute changes, formerly the bane of an accountant's existence, now require only a few keystrokes.

Peritz and his staff also find that the PC helps to answer one-time requests for information. "Accounting departments are constantly deluged with requests for information. The pressure of dealing with all these requests, many of which are urgent, can get overwhelming." Before the arrival of the PC, the necessary data had to be searched out manually and then incorporated into freshly typed reports. Electronic retrieval, manipulation, and

printing on the PC has reduced several hours' work into one or two. Peritz's accomplishments with *VisiCalc* result from just a few hours of one-to-one training. He has never opened the manual. Remarks Peritz, "considering what I can do with the limited knowledge I have, it's really amazing."

Key Individuals

Although most businesses, particularly text-intensive ones like public relations firms, stand to benefit enormously from PCs, comparatively few executives in public relations firms now use them. Why has RF&R been successful in implementing an executive-use strategy? As in many business success stories, a couple of key individuals make the difference. Peter Finn, David Finn's son, is the founder and chairman of RF&R's Research and Forecast Division, a distinctly separate operation that conducts telephone surveys on behalf of clients.

Although the physical offices of the Research and Forecast Division are indistinguishable from those of RF&R proper, there is a big difference—the narrow halls are crowded with PCs. Each of the division's five top executives has a PC. Counting administrative support staff, there are 25 people in the division. There are 12 PCs.

Peter Finn describes himself as a computer nut, and his personal fascination with the PC has saved his division tens of thousands of dollars. During the last several years, the Research and Forecast Division has enjoyed a 35-percent revenue growth rate. Incredibly, and as a direct result of PC implementation, there has been no increase in head count, either administrative or executive.

The first PC was brought in to do survey analysis and reduce outside service bureau costs that were running roughly $15,000 a year. An even bigger benefit was the time and money saved by avoiding the typing of thousands of figures representing the statistical findings of the surveys. The machines that followed allowed executives to prepare reports summarizing the findings of the surveys. The PC merges tables with textual analysis to produce finished reports and produces color charts and graphs for high-level presentations. With a person/PC ratio of just 2:1, Finn thinks he finally has "enough PCs so that anytime someone wants to use one, he can find one."

PCs are edging out minis for use in a new project that the division is considering—computerizing its telephone surveys. Presently, each of the 32 telephone pollsters records responses by checking off boxes on a lengthy questionnaire. The completed forms, sometimes thousands of them, are dispatched to a service bureau for keypunching and tabulation. The cost for this service reaches $5,000 a year in printing costs alone, and the results of the survey are not known until all the questionnaires have been processed. If pollsters could key in responses onscreen, survey results could be monitored while the survey was in progress. If a strong trend was detected early on, the number of responses needed might be substantially

reduced. Statistically valid findings could be had sooner and at less cost.

A few years ago, minis with dumb terminals would have been the logical choice for an application of this sort. But today, PCs can do the job more reliably for less money. A mini that can support 32 VDTs costs around $50,000 for the CPU alone. Even if the VDTs could be had for $1,000 each, the price for the complete mini configuration might approach $100,000. In addition, should the CPU fail, the entire operation would crash to a screeching halt. "We'd be out of business," says Finn. He has his eye on the IBM PC*jr*. By his estimate, he could equip each pollster with one for $1,500 apiece. And a single hardware failure could not cripple the operation.

The other key figure in the computerization of RF&R, Felix Kaufman, joined the firm at about the same time that the first PC was introduced at the Research and Forecast Division. A former partner at the accounting firm of Coopers & Lybrand (C&L), Kaufman knew a great deal about management. He also knew a lot about computers. In fact, he pioneered data processing practice at C&L. Realizing the value of PCs to an organization such as RF&R, Kaufman set about introducing PCs from the top level down. He was the one who got David Finn his own PC. "I wanted the rest of the organization to know the top guy in the company was using a PC." Next, Kaufman placed PCs in two prominent account groups. This was crucial. News of failure here would have quickly spread throughout the firm. With the assistance of an outside *WordStar* trainer, the members of the account groups learned what the system could do. In a matter of months, each machine was in constant demand.

Training

With the success of the two pilot programs, Kaufman supplied PCs to all the account groups and established a standardized training program. Ivy Rappaport, who had prior experience with Wang word processors, now directs all training for RF&R. "My main job," states Rappaport, "is to instill confidence." This explains why there are two PCs in her office. Bringing the students into her private workspace allows her to provide a learning environment far from the maddening pace of public relations work.

Although many people at RF&R are eager to learn the new systems, others resist. Pleading lack of time, they cancel their appointments to begin training. The introduction to the PC must be gradual. "Once they get started," Rappaport says, "they're fine."

Rappaport generally finds executives more eager to learn to use the new technology than the sometimes recalcitrant administrative staff. An executive's self-confidence level often is higher. However, this self-assurance can also be an obstacle. An executive will often eschew formal training and say, "Quick, just show me how to do this." This type of person may begin using the programs rapidly, but may never learn advanced functions. Those with the patience to go through the formal program master all the skills.

The introduction, training, and phasing in of a computer system can present a multitude of other problems. RF&R's problems were typical.

Competition for time on the limited number of PCs was a serious concern during the startup period at the Research and Forecast Division. "Somebody would get on a PC," recalls Peter Finn, "and write up a questionnaire. Then they'd go off to a meeting. The minute they walked out, somebody else took the computer. Then the first person would come back to finish the questionnaire and somebody else would be on. Work was simply not getting done because people would start something and couldn't finish."

Rappaport concurs. "What would happen was that someone would put a month-end report on the PC, which would be held up by another person doing a proposal needed for a meeting in 2 hours." The solution was to install more PCs.

Still, the limited number of PCs at RF&R is an ongoing concern. Most of the PCs are located in or around the secretarial desks that compose the physical core of the account groups. Since revisions constitute the bulk of the tasks done on the machine, administrative personnel need the quickest and most frequent access to them. Some groups, though, have put their PC on a rolling cart. Executives can spirit the machines away to their private offices when they need to spend some quiet moments composing their thoughts on the screen.

Fear of losing administrative staff was another potential problem. With only four administrative people supporting 20 executives when the PCs came on the scene, some executives were afraid of losing the secretaries they had. There are still only four secretaries 18 months and 12 PCs later. Executives find that they need not rely on secretaries as much. Moreover, they claim they do better work on a PC.

Why PCs?

RF&R has turned to the PC while many other companies emphasize mainframes, micros, and shared-logic word processors. The Research and Forecast Division uses its PCs to produce its own survey analyses, eliminating costly outside service bureau work previously done on an IBM 4331 mainframe. As for word processing, RF&R still uses its large IBM shared-logic

PR FIRM

system with a formal word-processing pool, established prior to the advent of PCs. With executives using PCs to produce more and more of their own copy, the word processing department is free to concentrate on maintaining large media-distribution lists. Using a laser printer to produce large quantities of high-quality

Executives can spirit the machines away to their private offices.

reports, what used to be only a word processing department now functions almost as an in-house printing operation.

The success of PCs at RF&R is attributable to several factors. First, the nature of their business and personnel. Time pressures, infinite revisions, and the limited availability of secretarial help have made word processing indispensable, as in many companies.

A second factor is one common to business success stories—the influence of key individuals. Peter Finn, the young chairman of the Research and Forecast Division not only successfully computerized his operation in less than 2 years, but also demonstrated the PC's benefits to RF&R as a whole. And the process he began is being implemented skillfully and wisely by Felix Kaufman, whose experience with business computers began 30 years ago. A mainframe expert, Kaufman remained flexible and receptive to the newer PC technology. More importantly, he possesses the management and organizational skills necessary to introduce fundamental changes in a company of over 250 people. The combination of new technology and experienced management work together to achieve for the company as a whole what PCs do for individuals—amplify human potential. ■

Scott Kariya is a free-lance writer specializing in PC business applications.

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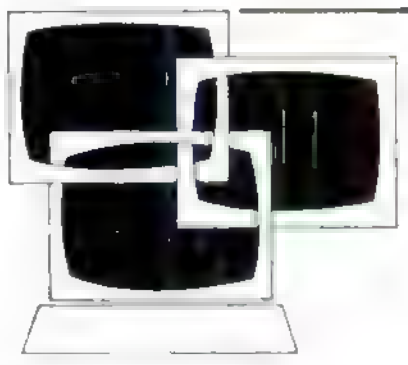

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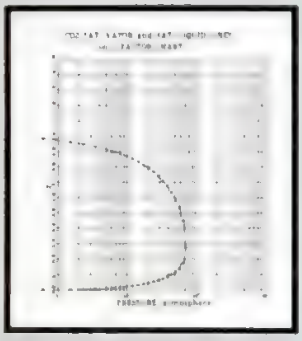
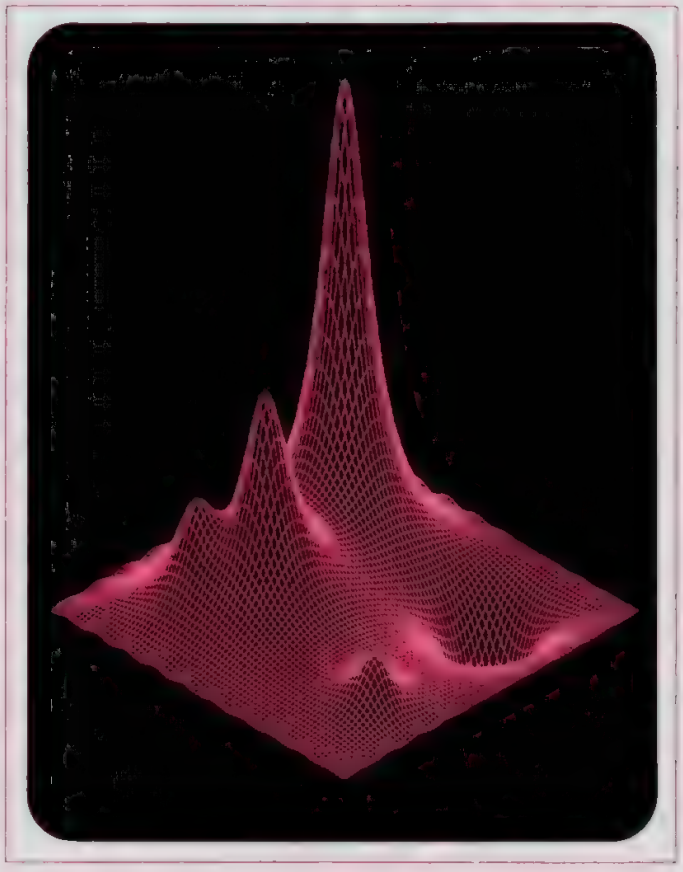
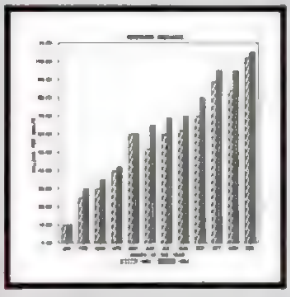


Scientific Plotting

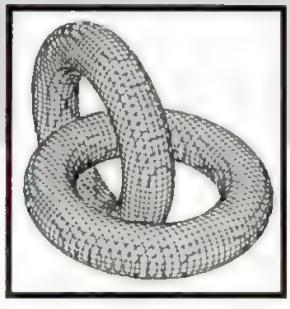
Symbol Sets



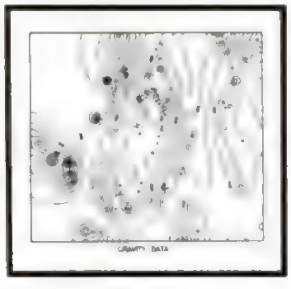
Digitizing



Business Graphics



Program Output



Contouring

PLOTCALL is a graphics system that processes standard plotter instructions into a form that can be printed on over 20 dot matrix printers. This is not another print screen program; presentation quality graphics are created directly on the printer to achieve the maximum resolution possible. (120 x 216 dots per inch for Epson printers)

PLOTCALL includes 17 symbol sets for sign making and plot labeling. Symbol sets may be altered, or create your own! Character strings may be created from any symbol set, rotated to any angle, and scaled to any size.

Plots can be created from any language or from digitized data. An interactive plot debugging program allows you to preview a plot on the screen before sending it to the printer.

All plots in this ad were created with **PLOTCALL** on an Epson printer. No additional hardware is required, not even the color graphics card!

Also included are the following easy to use, interactive programs that utilize the **PLOTCALL** system:

SURF creates high resolution three dimensional surface plots with hidden line removal.

TOPO creates contour maps using the same data as **SURF. TOPO** uses the character routines in the **PLOTCALL** system to provide inline contour labels.

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Cap That If You Can

Data Translation, a Massachusetts manufacturer of PC-compatible hardware, has used competitive prices and a unique ad campaign to carve out a niche in the PC aftermarket.

Finding the right niche is the secret of success in business. The PC has not only found its own spot; it has also created cozy niches for countless software, peripheral, and compatible manufacturers. This is the story of Data Translation, of Marlboro, Massachusetts, a firm that found a way to cash in on the success of the PC.

Data Translation is a prominent fixture in the "silicon belt," the string of computer-related firms that lines Route 128 around Boston. The company makes a wide variety of boards and other products for many different computers, but it has essentially a single mission. "We make hardware and software to improve measurement and control," said president Fred Molinari, Jr. "That's our claim to fame."

A Golden Opportunity

The PC is ideal for many applications in measurement and control. All it needed was appropriate analog-digital input/output equipment to communicate with ana-

log equipment. With the addition of a pin-compatible I/O module, the PC could be put to use in thousands of applications, from monitoring lab experiments to automating assembly lines—and could do so very inexpensively. Such tasks were once confined to the more costly minicomputer. The right peripherals would let a PC perform the same role as a minicomputer for thousands of dollars less.

But the PC needed the right add-on hardware and software, and that need spelled opportunity for Data Translation. The company soon developed a highly lucrative business supplying low-cost PC-compatible I/O boards and other products. In time, Data Translation was one of the world's leading manufacturers of microcomputer analog/digital I/O equipment.

Data Translation already had a reputation as a fast-growth company. In only a decade, it climbed to $11 million in annual sales, and for 3 consecutive years was named by *Inc.* magazine as one of the 100 to 500 fastest-growing firms in America. Thus far Data Translation has been growing by about 50 percent per year and is aiming for a long-term annual growth rate of roughly 37 percent.

The PC made success even easier for Data Translation. IBM was the first manufacturer to come out with a low-cost, powerful 16-bit personal computer, and the size and stability of both the market and the manufacturer made the PC a logical choice for Data Translation. "IBM wasn't going to default financially," said Molinari. "It had a huge marketing and distribution capability, and a big scientific and industrial market."

Science and industry provide a very fast-growth market for PCs and PC-compatible products, said Data Translation's product marketing specialist, Shari Supernault. *Explosive* might be an even better word. Scientists and engineers are putting PCs to work doing everything from counting subatomic particles to prospecting for oil. Data Translation hardware and software help computers do their jobs quickly and reliably, at an affordable cost.

The company developed a lucrative business supplying low-cost PC-compatible I/O boards.

Punching the Real-Time Clock

Data Translation customers (roughly 60 percent laboratory users and 40 percent in industry) value the company's products not only for their reasonable price tags and PC compatibility, but also for their real-time measurement capabilities.

Real time is the heart of good measurement and control. The more accurate your readings, the more effective your control will be. Data Translation products can chop time so finely that they bring users

within the proverbial gnat's whisker of the here-and-now. The company advertises one system built for laboratory use, the LAB-DATAX, as able to handle more than 100,000 samples per second, to or from memory.

Data Translation also likes to emphasize the flexibility (in input resolution and input gain range, for example) of its products, which are based on interchangeable modules that can be plugged in or out as the occasion demands. This kind of flexibility is important to the firm's customers, who put its products to a wide variety of uses.

Supernault listed a few examples of enterprises where Data Translation boards and other equipment turn up. Medical researchers, she said, are using Data Translation I/O equipment to test chemicals that may one day be used to save human lives.

The energy business depends on that kind of equipment too. "In oil-well logging, companies searching for oil deposits will put thermocouples and other instruments down into a drilled well and monitor data from them," said Supernault. "The combination of temperature and pressure readings reveals whether or not they're likely to find oil there."

Oil also concerns the navy, which must make its fleet as fuel-efficient as possible and gets assistance from analog/digital I/O gear. "They record oil usage and other variables in order to improve the energy efficiency of ships," Supernault explained. This application of computer-guided measurement and control saves the Defense Department huge sums of money every year on fuel bills.

Civilian industry finds analog/digital I/O equipment equally useful for cutting waste and costs. "Consider high-speed processes used to make paper," Molinari said. "The manufacturer must constantly measure factors like humidity, consistency, and thickness of paper at many different points along the roll. Poor measurement and control will mean lots of waste, whereas good measurement and control will mean just the opposite," he added.

Science and industry provide a very fast-growth market for PCs and PC-compatible products.

So far, nearly all Data Translation's customers are in science and industry. But individuals could afford the equipment too, for use with home computers. Theoretically, we could eventually be using

PCs with I/O peripherals to automate our homes. PC-based home management systems could adjust our thermostats for maximum energy efficiency, remind us when the next oil delivery is due, and turn off lights for us automatically after we leave a room.

It's all possible, said Supernault. "There are all sorts of applications in the home environment. People can afford to automate many different processes. And," she said with a satisfied smile, "we're sitting right in the center of it all."

Aggressive Marketing

Even the most useful and cost-effective product or service must be marketed before it will sell, and Data Translation has an aggressive and imaginative marketing strategy.

"We're into direct sales and marketing," said Supernault. "Lots of PR announcements. We're getting into the journals, and we're openly asking for dealer inquiries, everything from large dealer operations to smaller, independently owned dealerships. We're also into trade shows and heavy advertising."

Data Translation ads are legendary for Molinari's wild performances. At first glance, Molinari hardly looks like a master showman. He is an ordinary-looking man of average height and weight, soft-spoken and conservatively dressed—not the kind of person who stands out in a crowd.

But in Data Translation's ads, Molinari undergoes an amazing transformation from a mild-mannered business executive into a flamboyant pitchman. These ads are guaranteed to make you smile—and remember them.

Other corporate chiefs, like Chrysler's Lee Iacocca star in their companys' ads. But can you imagine Iacocca wrapping himself up in a straitjacket to show that his employees "work like madmen?" Molinari did just that for one ad photo. In other advertisements, Molinari has donned a crash helmet to illustrate how fast his products get jobs done, and in another, posed as a magician pulling a miniature replica of himself out of a hat. In one elaborate visual pun, he posed as a whole squadron of smiling bus drivers, each with a name like Unibus or Multibus emblazoned on his cap.

Data Translation has an aggressive and imaginative marketing strategy.

Data Translation's products have been just as innovative as its advertising, and the company has disproved the belief that innovation doesn't pay by scoring an impressive number of firsts. Molinari recited a few of them: "We were the first to put analog-digital IN and digital-analog OUT on a single board," he says, holding

DATA TRANSLATION

Data Translation ads are legendary for Molinari's wild performances.

up the board for inspection. He also pointed out that Data Translation introduced the computer industry's first "intelligent analog peripheral" (IAP), which used an 8085A microprocessor added to an analog I/O board. The IAP took over high-speed data acquisition and control activities, thus enabling the host microprocessor, which previously had to handle those jobs, to concentrate on data processing alone.

Looking Ahead

The future appears bright for Data Translation, if PC sales projections are any guide. "Let's say that 250,000 IBM PC units are sold each year in the scientific and industrial market," said Molinari. "That's 1 billion dollars." What fraction of that market will be looking for interfaces like those Data Translation provides? Molinari thinks 10 percent is an appropriate figure. Users of IBM-compatible machines could provide DT with an additional growth market.

Data Translation owes its prosperity to the PC and systems like it, and Molinari sees his firm's success as part of a healthy symbiosis between the makers of computers and the suppliers of software and peripheral hardware. "We're riding a wave," he says, "and at the same time helping it along." ■

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CIRCLE 410 ON READER SERVICE CARD

Menus For Printer Magic

Even nonprogrammers can enjoy the advanced features of the Epson FX printer with the menu-driven Set-FX program. Choose from a smorgasbord of font styles, print modes, and formatting options by pressing a single key.

The Epson FX printer, a more sophisticated version of Epson's popular MX, is loaded with printing functions. You can print documents with Roman and italic fonts, six different pitches, two kinds of boldface (doublestrike and emphasized), 16 print mode combinations (such as singlestrike-elite, doublestrike-compressed, singlestrike-expanded-compressed, and doublestrike-emphasized-expanded-pica), underlining, and superscripts and subscripts. You can also print with international character sets (although the choice of characters is limited, particularly in the case of Japanese) or define your own character set. Paper-handling functions include horizontal and vertical tabs, margin selection, perforation skip, and forward and reverse line feeds.

Twelve of these functions are controlled by easily accessible DIP switches, but the rest of the features of this extraordinary machine require BASIC control codes. For example, you can use the FX to mix a wide variety of fonts, but for anything the least bit complicated you will have to write a lot of BASIC code for printer instructions. At this point, it isn't word processing anymore—it's programming.

A program called *Set-FX*, written by Bob and Gail McDowell and sold by Soft-Style, Inc., of Honolulu, Hawaii, allows you to print a file using combinations of various Epson FX features selected from menus. It can't do everything—it can't replace a word processor that permits you to embed printing codes in order to print different text in different fonts in a single print run—but it is a very powerful tool, indeed.

The software package includes a single-sided disk with 138,752 bytes on it, a 48-page instruction booklet, a quick reference card giving printer control codes, a registration card, an extra label that you can stick on your backup copy, and a thick, vinyl-covered cardboard folder that gives the package a hefty feel. Add the price of *Set-FX* to the cost of the Epson FX

and, for the money, nothing can beat it.

Set-FX has two major files: Setfx and Fxfont. The first, Setfx, is 11,520 bytes in size and fits nicely on your DOS disk. It contains two menus: Standard and Advanced (see Figures 1 and 2). The Standard menu allows you to choose print modes, line spacing, and certain program options. You can combine the Epson font in Roman or italic style (or a font you have created yourself) with settings for pica, elite or proportional spacing and six type faces: emphasized, condensed, doublestrike, wide, superscript, and subscript. Type faces can be combined to create characters with a distinctive appearance. Line spacing can be set at six or eight lines per inch or a multiple of 1/216th of the inch, which allows you to print the tiniest type in closely spaced lines. Special options permit the printing of a test pattern. To quit Setfx, you hit the Esc key, which automatically sends the appropriate control codes to set up your printer.

Format Control

Because about two-thirds of all word processors do not give you the option of sending control codes to the printer, you may want to print directly from a file. The Advanced menu of the Setfx file provides some control over formatting. By setting values for the following options, you can instruct the printer to signal when it is out of paper, to skip over perforations, to set the form length in lines or inches, and to determine the left and right margins, the top-of-form feed, and a blank-line feed. Because there is a slight misalignment in vertical composition in bidirectional print-

Set-FX
SoftStyle, Inc., #205, Dept. C11
7192 Kalanianaole Hwy.
Honolulu, HI 96825
(808) 396–6368
List Price: $59.95
Requires: 64K RAM, one disk drive, Epson FX-80 or FX-100 printer.

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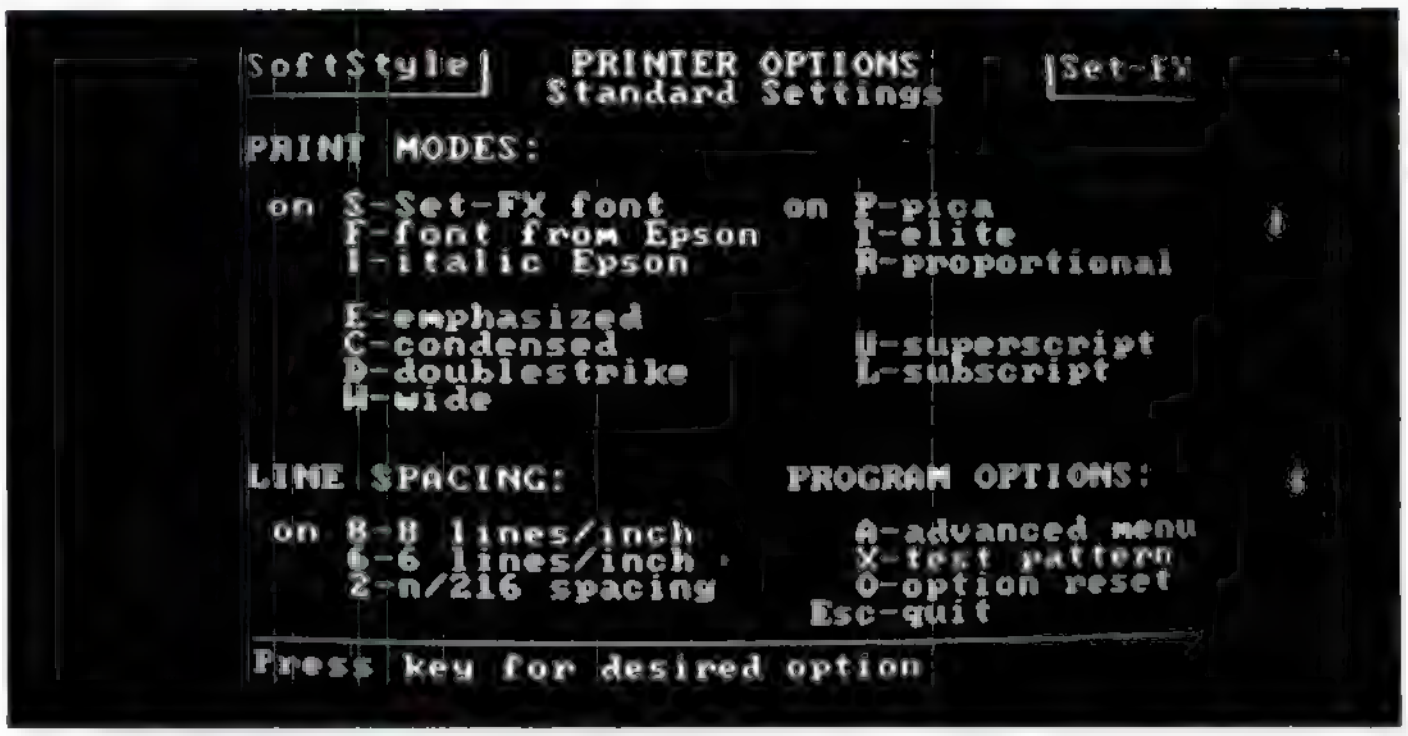


Figure 1: *The* Setfx *Standard menu lists standard printer options that can be chosen by pressing a single key.*

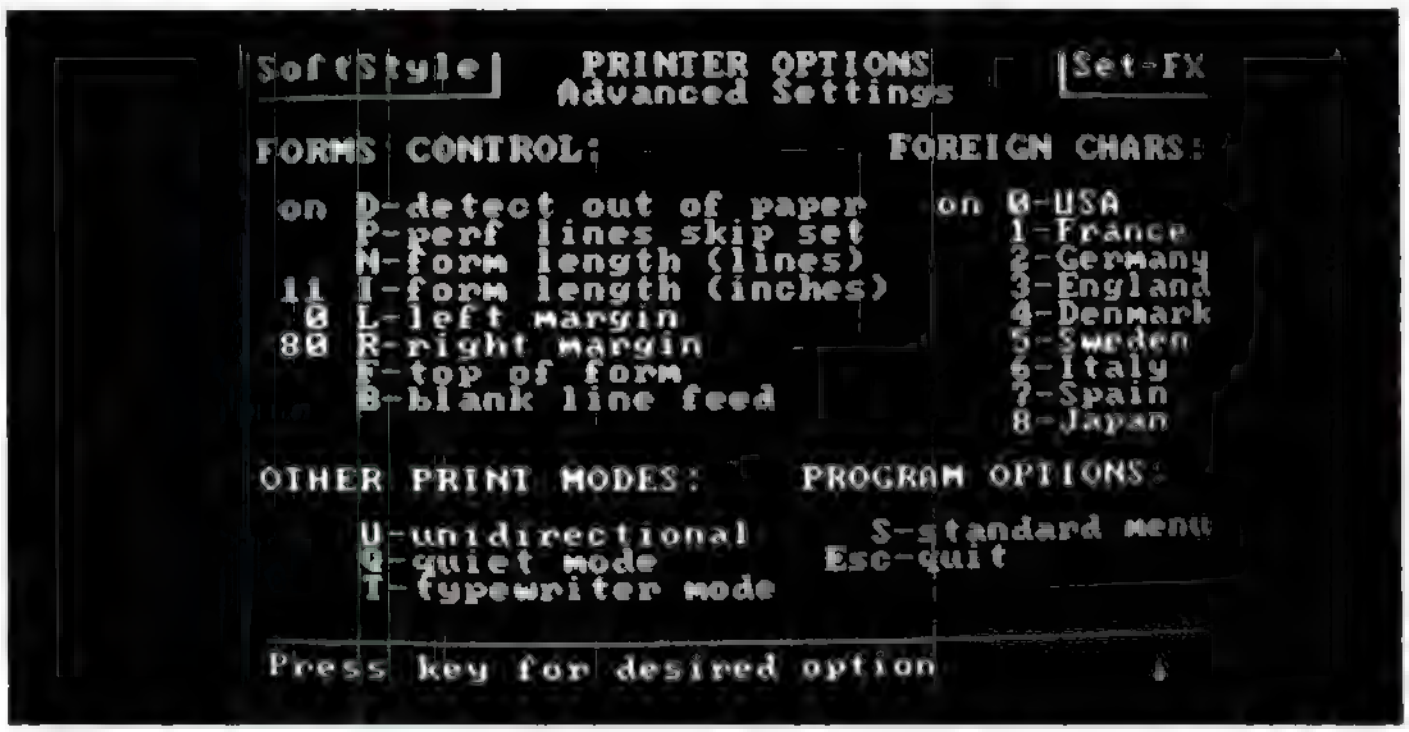


Figure 2: *The* Setfx *Advanced menu gives you access to foreign character fonts, unidirectional printing and other print modes, and various formatting features.*

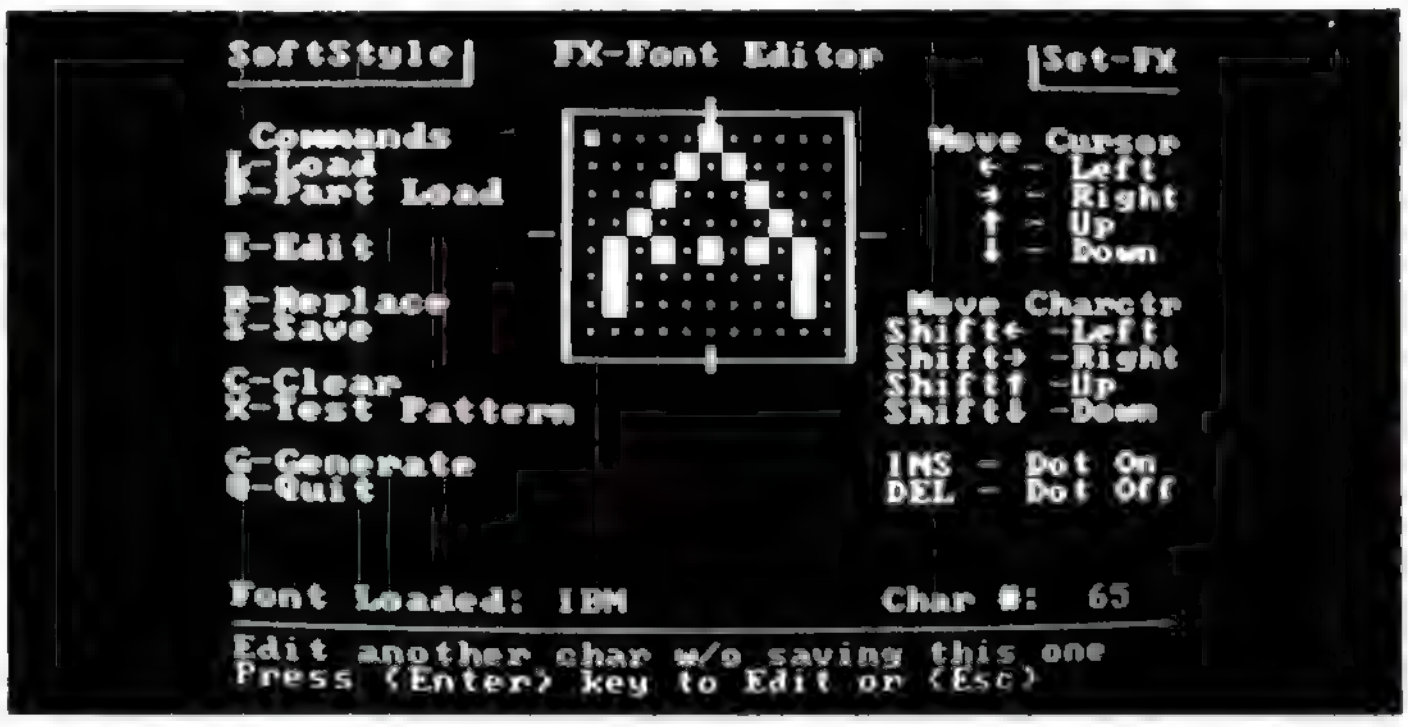
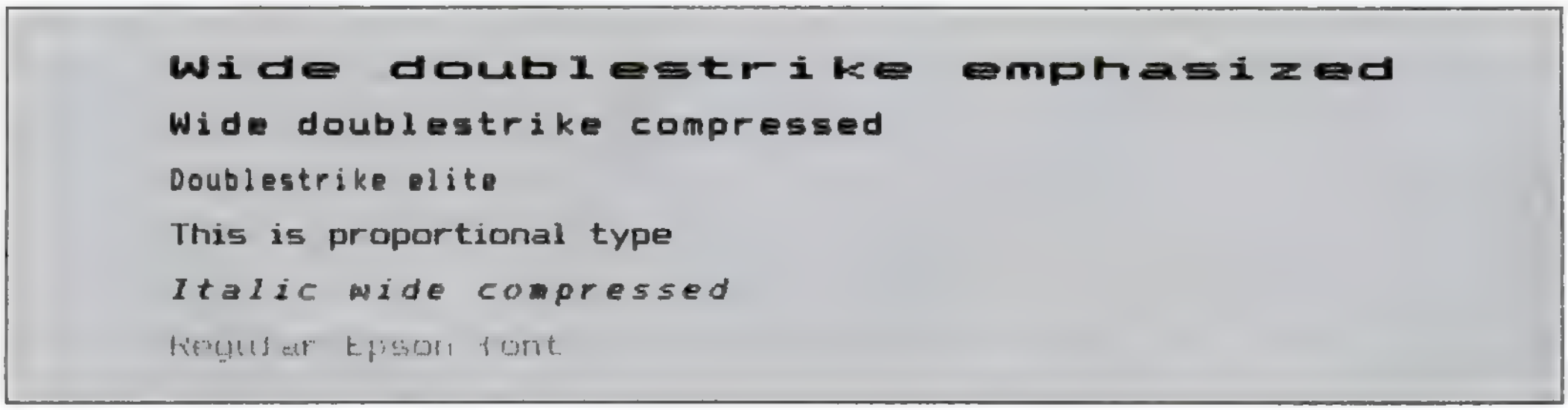


Figure 3: *The* Fxfont *editor allows you to build your own font character or graphic symbol in an 11 x 8 matrix.*



Set-FX can produce different styles of type.

ing with the Epson FX, you can select unidirectional printing for graphics. Another choice in the Advanced menu is a quiet mode, which slows the printing speed by half to moderate late-night complaints about printer noise from neighbors.

The Advanced menu also offers a "typewriter mode." Text appears on the monitor at the same time it is output to the printer as you type. When you pause at the keyboard, the printer rolls up the paper so you can see what you have typed, then reverses the paper feed to continue the line when you begin typing again. You can also elect to use the Epson foreign character fonts, including French, German, Danish, Swedish, Spanish, and Japanese. A special IBM-style font is also included on the *Set-FX* disk; it prints all the characters, foreign and standard, that appear on the IBM monitor, including the graphics symbols of the last 128 ASCII codes.

The Font of Creativity

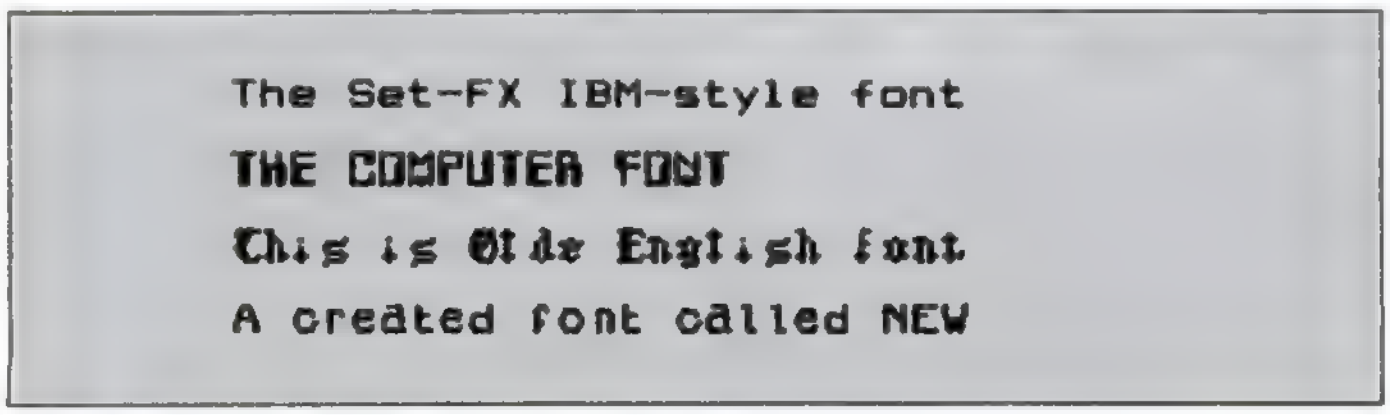
The other major program in *Set-FX*, Fxfont, allows you to create your own special font or graphics characters. You use the cursor to put dots on an editing screen 11 squares wide by 8 squares high (see Figure 3). These define your characters, which are then saved to disk as a font. The new font is used to "generate" a new control program similar to Setfx. The new control program is automatically renamed with the name you give your new font. Making new fonts is made less tedious by the detailed, colorful menu that surrounds the editing screen. (For some reason the Setfx menus are rendered in white on black.) You can create a font from scratch or alter one of the fonts that comes with *Set-FX*. *Set-FX* offers the IBM-style font, plus Olde English and computer-style fonts. A test pattern print option allows you to see how you are doing as you create a new font. You can replace a character in a standard font with another character or replace whole portions of one font with parts of another.

The manual explains how to define a character, then save it to disk to generate a new font, but it doesn't really explain how to go on to the next character. When the menu queries you with the message—"Edit another char w/o saving this one"—it is easy to get confused. The interactive line on the menu is really asking if you want to save the font, not the character. After placing your first created character in the font, you should just go on and edit the second. The font is saved after you have defined it completely. The Generate command then creates a new .exe file that serves as a Setfx program for the new font. The process is relatively simple. It's easy and fun to create odd characters. You can even make large letters or logos by putting portions of the final design on two or more screens.

SoftStyle's *Set-FX* is relatively inexpensive and offers a lot of features for your money. The system is deliberately copiable to permit you to make backup copies and to allow you to use it on a hard disk. The serial number of the disk appears on the introductory screen to serve as a deterrent to unauthorized copying.

The Advanced menu also offers a "typewriter mode."

SoftStyle's philosophy is that any copy protection device will be circumvented eventually, and that the best way to ensure purchase over piracy is to provide good user support, enhancements and upgrades, and occasional distribution of tip sheets to registered owners. (Version 2.1 of *Set-FX* is available free of charge to registered owners of the original version.) With an attitude like this and software like *Set-FX*, the company should go far. ■



Set-FX allows you to create several different fonts.

The Sound Of Music

Using BASIC instructions, the authors of the BASIC Primer for the IBM PC explain how to program your computer to play beautiful music—anything from Bach to Bartok.

With this issue, PC begins a series of book excerpts designed to help our readers use BASIC for the PC. Portions of this and future articles—reproduced with permission from the copyright owners—will be included in the book *BASIC Primer for the IBM PC* by Bernd Enders and Bob Petersen, to be published by The New American Library under the Plume/Waite imprint, copyright © 1984 Waite Group Inc., San Rafael, California. All rights reserved. This chapter explains how to program your PC to produce music using BASIC.

Your PC is equipped with a versatile system for producing musical sounds. The musical sounds played by a musician are encoded in one language (musical notation) that must be converted to another language (BASIC), which can then be used by the computer. This chapter will give you a short course in music fundamentals, taking you from conventional sheet-music notation to the BASIC commands that will allow you to play this music on your IBM PC.

Music will add interest and variety to programs on your PC. It is also helpful to put sound in a program to get the operator's attention. Musical sounds can be used to indicate when an error has occurred . . . or to alert the operator that it is time to change diskettes or to turn on the printer, or simply to indicate that all is going well in a long computing process. This last use of sound gives the operator the freedom to move about in the room and not have his eyes riveted to the screen all the time.

There are two BASIC statements that give the PC the ability to make sounds. The first is the SOUND statement.

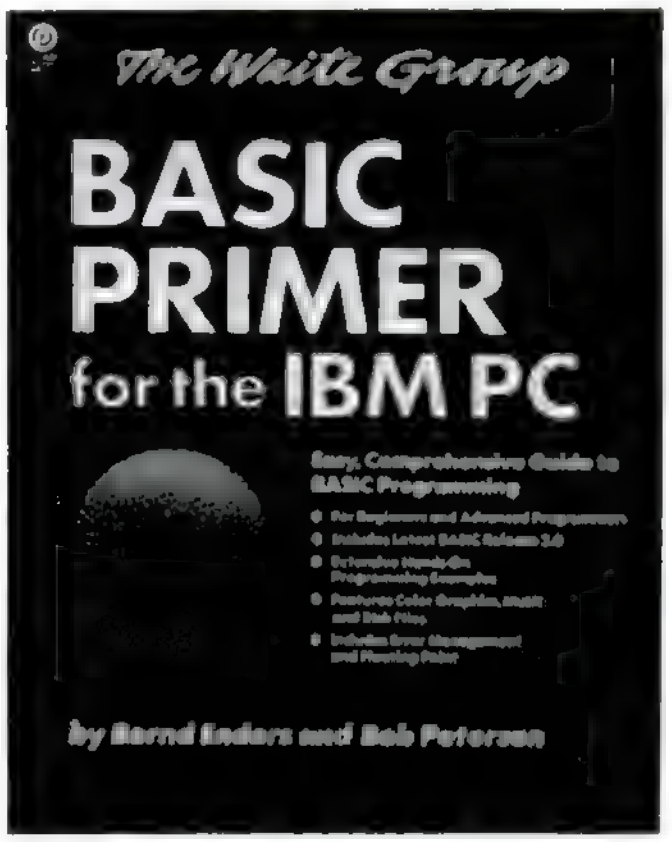
The SOUND Statement

The SOUND statement has two arguments or modifiers. They are the *frequency* and the *duration* arguments. An example of this is shown in Figure 1.

Try the following on your PC and listen to the "music of the spheres":

```
Ok
SOUND 1000,10
Ok
SOUND 1000,20
Ok
SOUND 2000,20
Ok
SOUND 4000,10
Ok
```

If the paint is still on the walls, you will have noticed that the first sound at 1000 hertz was just half as long as the second. The sound will last approximately one second when a duration number of 18 is giv-



BASIC Primer for the IBM PC.
Bernd Enders and Bob Petersen
(The New American Library, Inc., New York, forthcoming)
softcover, $17.95

CIRCLE 743 ON READER SERVICE CARD

en. These duration numbers are the internal clock ticks, which are used by the system to update the clock and for various other functions. The internal clock ticks 18.2 times per second. So the duration of 10 is 10/18.2 seconds, a little more than ½ second. The duration of 20 is twice as long as a duration of 10 and is a tad longer than a second.

In the third and fourth sound statements, the frequencies were doubled. The range of frequencies that may be programmed is from 37 vibrations per second (hertz) up to 32,767 hertz.

Sound in general is produced by the vibration of some object at a rate that the ear can detect. Most human ears work between the range of 20 to 20,000 hertz, although the ability to hear different frequencies varies from one individual to another. In addition, the loudness of the sound largely determines whether we hear it or not. Inside the PC there is a small speaker located just behind the IBM Personal Computer label on the main computer box. The loudness of this speaker is fixed and may not be adjusted. Because of the limited size of this speaker and the quality and loudness of the sounds it produces, you will find that not all sounds between 20 and 20,000 hertz may be heard. In short, you should not expect hi-fidelity sound from your PC.

We can still make a number of sounds that have a familiar ring to them, though. Figure 2 lists some examples for your

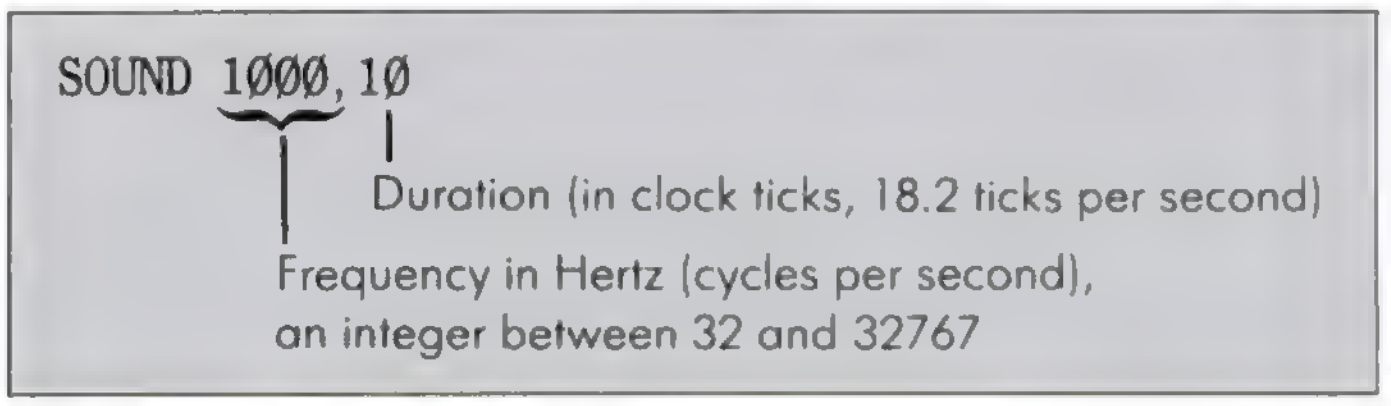


Figure 1: *The SOUND statement's two modifiers.*

```
1Ø '------ DROPPING -----------
2Ø FOR K=3ØØØ TO 6ØØ STEP -5   'sweeps frequencies
3Ø   SOUND K,K/5ØØØ            'variable frequency with variable duration
4Ø NEXT K
5Ø SOUND 3ØØØ,2                'striking sound
1Ø '------ AAA -----------
2Ø FOR X=1 TO 3                'repeats three times
3Ø   SOUND 44Ø,1Ø              'makes SOUND 44Ø Hertz for 1Ø ticks
4Ø     FOR K=1 TO 12ØØ         'produces delay between sound
5Ø     NEXT K
6Ø NEXT X

1Ø '------ SIREN ------------
2Ø FOR X=1 TO 4
3Ø   FOR L=7ØØ TO -7ØØ STEP -1Ø    'sets range for L
4Ø     SOUND 85Ø-ABS(L),.3         'frequency - L made positive
5Ø     L=L-2/7ØØ
6Ø   NEXT L
7Ø NEXT X

1Ø '------ SCOTLAND YARD -------
2Ø FOR X=1 TO 3                'makes sound combination 3 times
3Ø   SOUND 9ØØ,3
4Ø   SOUND 7ØØ,4
5Ø     FOR K=1 TO 16ØØ         'produces delay between sounds
6Ø     NEXT K
7Ø NEXT X

1Ø '------ TIMER ------------
2Ø FOR X=1 TO 1Ø
3Ø   SOUND 7ØØ,4
4Ø   SOUND 1ØØ,Ø               'turns sound off
5Ø     FOR K=1 TO 12ØØ:NEXT    'produces delay between sounds
6Ø NEXT X
7Ø SOUND 4ØØØ,1                'elapsed time signal

1Ø '------ CAR -----------
2Ø FOR M=6Ø TO 7Ø STEP 1Ø      'switches between two frequencies
3Ø   SOUND M,.Ø1               'makes sound with short duration
4Ø NEXT
```

Figure 2: *BASIC programs for some familiar sounds.*

Figure 3: *The treble clef.*

amusement. We hope that you will load and run each of these little programs and that you will find them not only amusing but also illustrative of the ways in which the SOUND statement may be used. In BASICA it is possible to run the SOUND statement in a background buffer, thus allowing a program to continue without interruption. This approach will be discussed in some detail in the following discussion of the PLAY statement.

Music and the PLAY Statement

IBM BASIC contains a very powerful sound-producing statement called PLAY. This statement, as the name implies, is used to generate music. Since some knowledge of musical scales and musical notation is necessary in order to understand how PLAY is used, we will need to review some of the elements of music.

Try entering the following program and see if the sound it produces is familiar:

```
10 SOUND 262,8      'C4
20 SOUND 294,8      'D4
30 SOUND 233,8      'B3-
40 SOUND 117,8      'B2-
50 SOUND 175,16     'F3
```

Just as computer instructions are written in code, so are the instructions to a musician. This coded form of instructions we call a musical *score*. The five lines of BASIC written above combine both computers and music. We will spend a few moments looking at this code and learning how to convert musical notation into computer commands.

Modern music uses a set of symbols to show the different tones that are to be played. The symbols are placed on a musical *staff*, which is composed of five lines and four spaces. The location of a symbol on a line or space gives the note the name of that line or space. The treble clef staff is shown in schematic form in Figure 3.

The *spaces* spell out the word "F A C E," starting with the lowest space and moving up the staff. The *lines* take on the letters "E G B D F" (E-very G-ood B-oy D-oes F-ine). Again we start with the lowest line and move up the staff. The higher up the staff, the higher the *frequency*, or tone, of the sound that the note represents.

You'll also note the letters are in alphabetical order as we move up the scale; the notes proceed from A to G and then the sequence is repeated. In western music there are eight notes before we begin to repeat. These eight notes comprise a unit called an octave. The eight notes are not equally spaced in frequency, but have whole and half steps as we go up the scale.

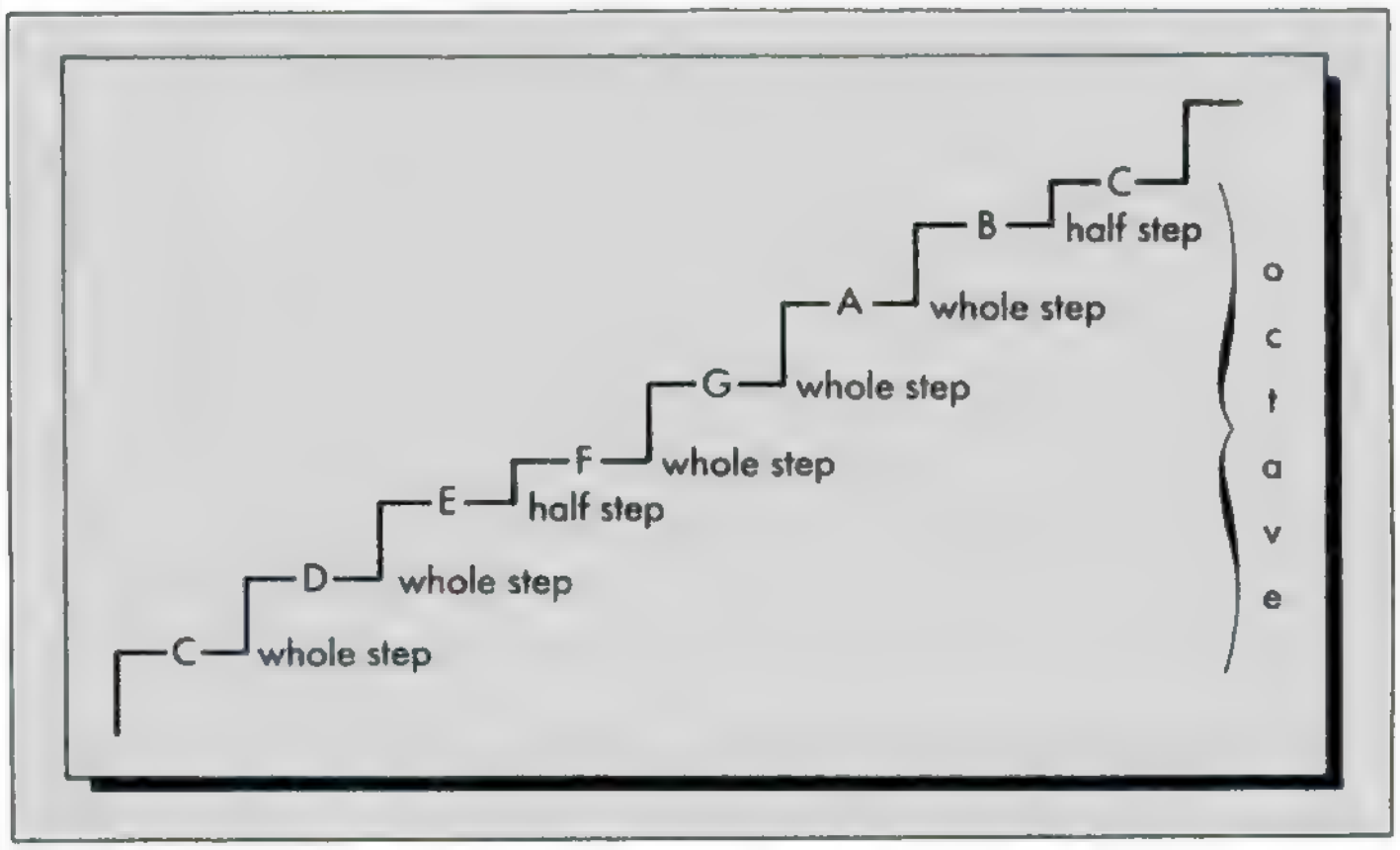


Figure 4: *A musical octave divided into diatonic half and whole steps.*

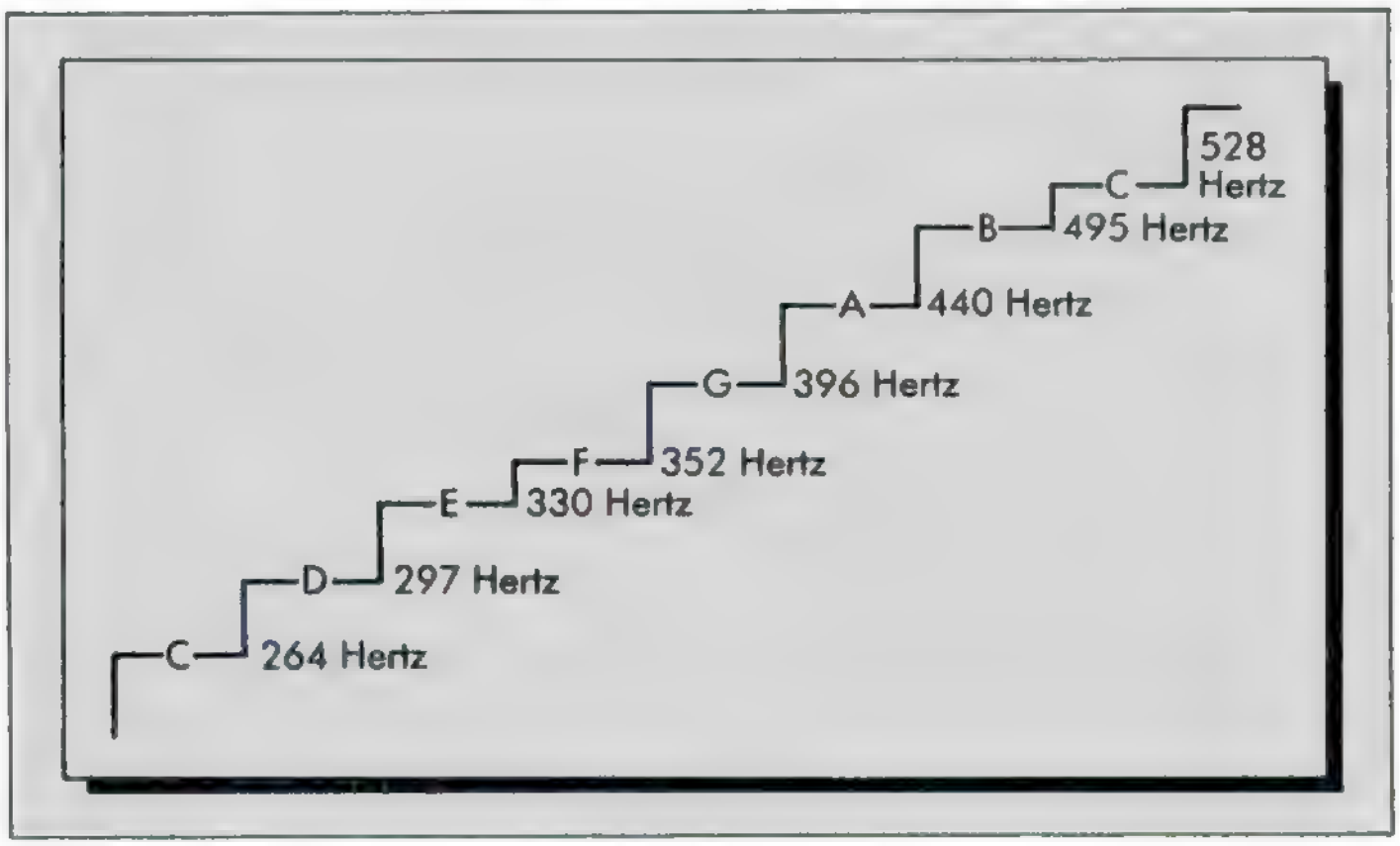


Figure 5: *Diatonic scale frequencies.*

Figure 4 shows the positions of the whole and half steps in the *diatonic* scale, which is a scale divided into eight tones whose frequencies are in the ratios of small integer numbers.

As we move up the scale, the pitch becomes higher. The diagram in Figure 5 shows the numeric frequencies of the middle octave portion of the diatonic scale. These frequencies may be used in the SOUND statement to give the pitch of a note—that is, to specify what tone you want the PC to make.

The numeric frequencies of the diatonic scale may be used to specify what tone you want the PC to make.

In the interest of developing more complex chords and larger combinations of instruments, many other musical scales have been developed. One such scale, known as the equal-tempered scale, was developed in the eighteenth century. This scale is based upon twelve equally spaced tones. While there are still eight notes to the scale, the sharps and flats have been added to make all possible half steps. The sharps are one half step higher than the "natural" notes. Thus, the note F has a neighboring note one half step higher called "F sharp." The flats are located one half step lower than the *natural* notes, so the note G has a note one half step lower called "G flat." Yes, G flat and F sharp are different names for the same note in this scale. There are no sharps (or flats) between E and F or between B and C, because they are already one half step apart from each other. These half steps become the black keys on a modern piano.

The note A sharp may be written as A#. In the PLAY statement, either A# or

Note	Equal-tempered frequency	Pythagorean diatonic frequency	Helmholtz notation	IBM octave number	IBM note number	Staff location
C0	16.352	17				
C0#, D0 –	17.324					
D0	18.354	19				
D0#, E0 –	19 445					
E0	20.602	21				
F0	21 827	22				
F0#, G0	23.125					
G0	24.5	25				
G0#, A0 –	25.957					
A0	27.5	28				
A0#, B0 –	29 135					
B0	30 868	31				
C1	32 703	33	CC	00	N1	
C1#, D1 –	34.648				N2	g
D1	36 708	37			N3	e
D1#, E1	38.891				N4	c
E1	41.203	41			N5	a
F1	43.654	44			N6	f
F1#, G1 –	46.249				N7	d
G1	48.999	50			N8	B
G1#, A1 –	51.913				N9	
A1	55.000	55			N10	
A1#, B1 –	58.27				N11	
B1	61.735	62			N12	
C2	65.406	66	C	01	N13	
C2#, D2 –	69 296				N14	g
D2	73.416	74			N15	e
D2#, E2 –	77 782				N16	c
E2	82 4107	83			N17	a
F2	87 307	88			N18	f
F2#, G2 –	92 4999				N19	
G2	97 999	99			N20	
G2#, A2 –	103 83				N21	
A2	110 00	11			N22	
A2#, B2 –	116 54				N23	
B2	123.47	124			N24	
C3	130.81	132	c	02	N25	
C3#, D3 –	138.59				N26	g
D3	146.83	148			N27	e
D3#, E3 –	155.56				N28	c
E3	164 81	165			N29	a
F3	174.61	176			N30	f
F3#, G3 –	185.00				N31	
G3	196 00	198			N32	
G3#, A3 –	207 65				N33	
A3	220.00	220			N34	
A3#, B3 –	233.08				N35	
B3	246.94	247			N36	
C4	261.63	264	c'	03	N37	
C4#, D4 –	277.18				N38	e
D4	293.66	297			N39	c
D4#, E4 –	311.13				N40	a
E4	329.63	333			N41	f
F4	349.23	352			N42	d
F4#, G4 –	369.99				N43	b
G4	392.00	396			N44	g
G4#, A4 –	415.30				N45	e
A4	440.00	440			N46	c
A4#, B4 –	446.16				N47	a
B4	493.88	495			N48	

Figure 6: *Notes with their frequencies, octave numbers, and notations in different systems.*

Note	Equal-tempered frequency	Pythagorean diatonic frequency	Helmholtz notation	IBM octave number	IBM note number	Staff location
C5	523 25	528	c''	04	N49	
C5#, D5 –	554 37				N50	
D5	587 33	594			N51	
D5#, E5 –	622 25				N52	
E5	659 26	666			N53	
F5	698 46	704			N54	
F5#, G5 –	739 99				N55	
G5	783 99	792			N56	
G5#, A5 –	830 61				N57	
A5	880 00	[illegible]			N58	
A5#, B5 –	932 33				N59	
B5	987 77	990			N60	
C6	1046.5	1056	c'''	05	N61	
C6#, D6 –	1108 7				N62	
D6	1174.7	1188			N63	
D6#, E6 –	1244 5				N64	
E6	1318 5	1332			N65	
F6	1396 9	1408			N66	
F6#, G6 –	1480 0				N67	
G6	1568 0	1584			N68	
G6#, A6	1661 2				N69	
A6	1760 0	1760			N70	
A6#, B6 –	1864 7				N71	
B6	1975 5	1980			N72	
C7	2093 0	2112	c''''	06	N73	
C7#, D7 –	2217 5				N74	
D7	2349 3	2372			N75	
D7#, E7 –	2489 0				N76	
E7	2637 0	2664			N77	
F7	2793 8	2816			N78	
F7#, G7 –	2960 0				N79	
G7	3136 0	3168			N80	
G7#, A7 –	3322 4				N81	
A7	3520 0	3520			N82	
A7#, B7 –	3729 3				N83	
B7	3951 1	3960			N84	
C8	4186 0	4224	c⁴	NA	NA	
C8#, D8	4434 9					
D8	4698 6	4744				
D8#, E8 –	4978 0					
E8	5274 0	5328				
F8	5587.7	5632				
F8#, G8 –	5919.9					
G8	6271.9	6240				
G8#, A8 –	6644 9					
A8	7040 0	7040				
A8#, B8 –	7458 6					
B8	7902.1	7920				
C9	8372.0	[illegible]	NA	NA	NA	
C9#, D9 –	8869.8					
D9	9397.3	[illegible]				
D9#, E9 –	9956.1					
E9	10548.1	10656				
F9	11175.3	11264				
F9#, G9 –	11839.8					
G9	12541.9	12480				
G9#, A9 –	13289.7					
A9	14080	14080				
A9#, B9 –	14917.2					
B9	15804.3	15840				
C10	16744.0	16896	NA	NA	NA	

A+ may be used to indicate A sharp. Similarly, while musical convention uses B*b* to indicate the half step below B called "B flat," in the PLAY statement we use the symbol B–. With most musical instruments, it is possible to play more than one octave. In order to keep track of which octave the note is located in, it is necessary to have a system of nomenclature. One such system is called the "USA Standard," which uses a number located after the letter of the note. For example, middle C on the piano is C4, the C in the fourth octave. A2# would be the note A# in the second octave.

The IBM PC uses a system called Octave Number to denote the octave location.

Other systems for declaring the octave, such as the Helmholtz, have been developed. The Helmholtz system uses a system of uppercase letters, lowercase letters, and apostrophes. Figure 6 shows this system of notation along with the frequencies of the notes in each of the two scales (the diatonic and the tempered) we have talked about.

The IBM PC uses a system called "Octave Number" to denote the octave location. The letter O (not the number 0) is used followed by the number of the octave. Thus O3, for example, would be the octave in which the middle C (C4) on the piano is located. In Figure 6, the column labeled "IBM octave number" gives the values for each of the octaves O0 through O6 (seven octaves).

We need to make one further point about musical notation in order to make full use of Figure 6. In order to indicate a wider range of notes covering more octaves, a system of two staffs is used in the written musical scores. The upper staff is called the *treble* and the lower is called

the *base*. Each is given a symbol to indicate its location. More than one octave may be shown on a single staff, extending beyond the range of the staff. The treble clef and the base clef are shown in the diagram in Figure 7.

The symbol OO1 is used to denote the

PLAY is written with the tempered scale; should you prefer to use the diatonic scale, you will need to rewrite your program.

treble portion, while the symbol OO2 is used for the base portion of the musical scales. The use of a sharp (#) or flat (*b*) symbol next to the clef symbols means that *all* notes on that line or space are to be made sharp when the sharp symbol (#) is present and made flat when the flat symbol is present. If the note is to be made natural (that is, neither flat or sharp), the symbol OO3 before the note means all such notes will remain natural for the remainder of that measure. In addition to these prefix-like notations, there will be some indication of the duration of a note (timing).

Figure 6 shows the octaves and their various musical notations for the audible range of musical instruments. The first column (Note) shows the USA Standard notation for the musical octaves (including sharps and flats). The second and third column give the frequencies of each note in the tempered and diatonic scales. The fourth column is the Helmholtz notation, with which many musicians are familiar. The IBM octave code is given for use in

```
100 PLAY "o3bb>cddc<ba"
          |     |
   up one octave   down one octave
```

Figure 8: *Use of the < and > symbols in the PLAY statement.*

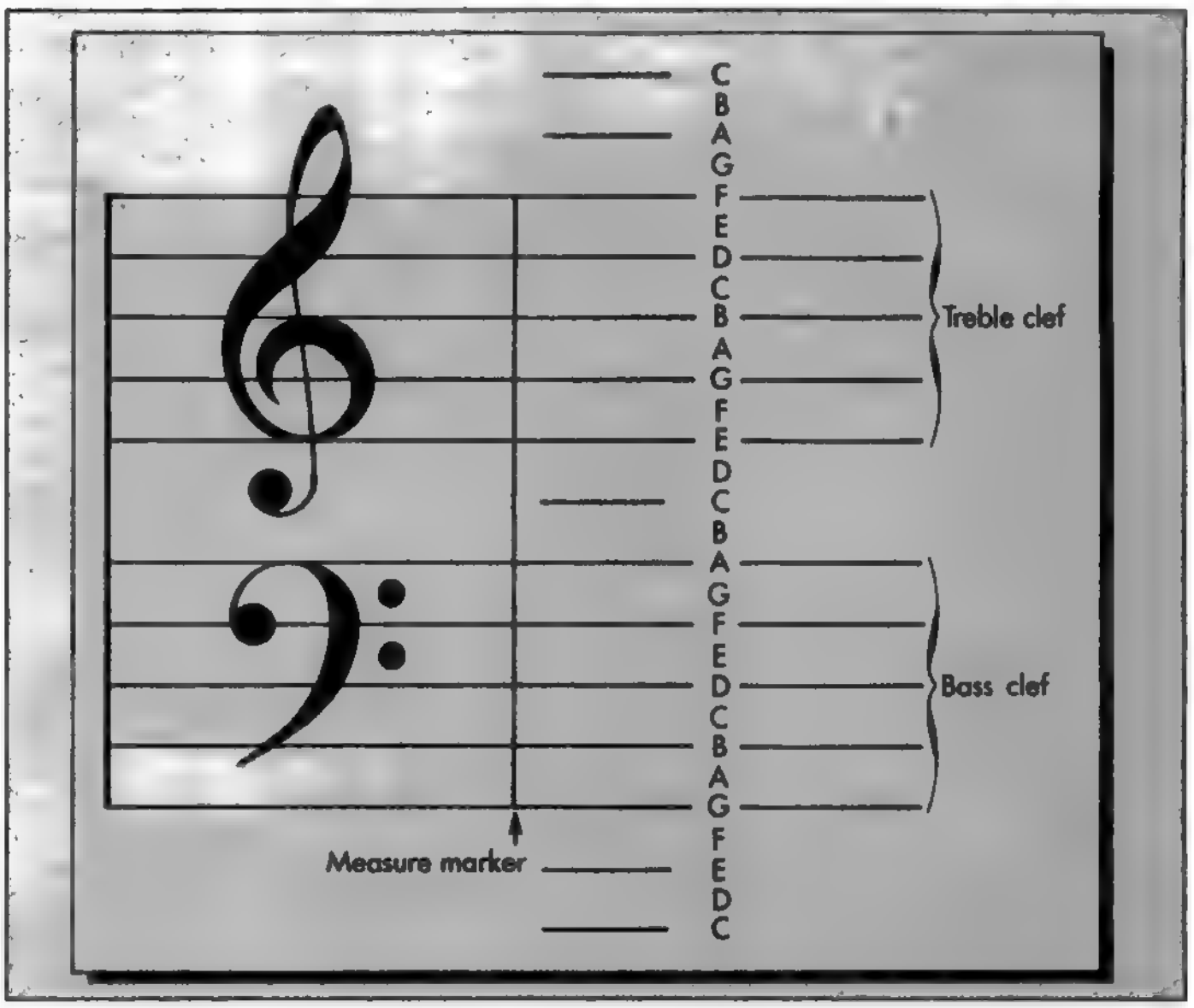


Figure 7: *The musical staff.*

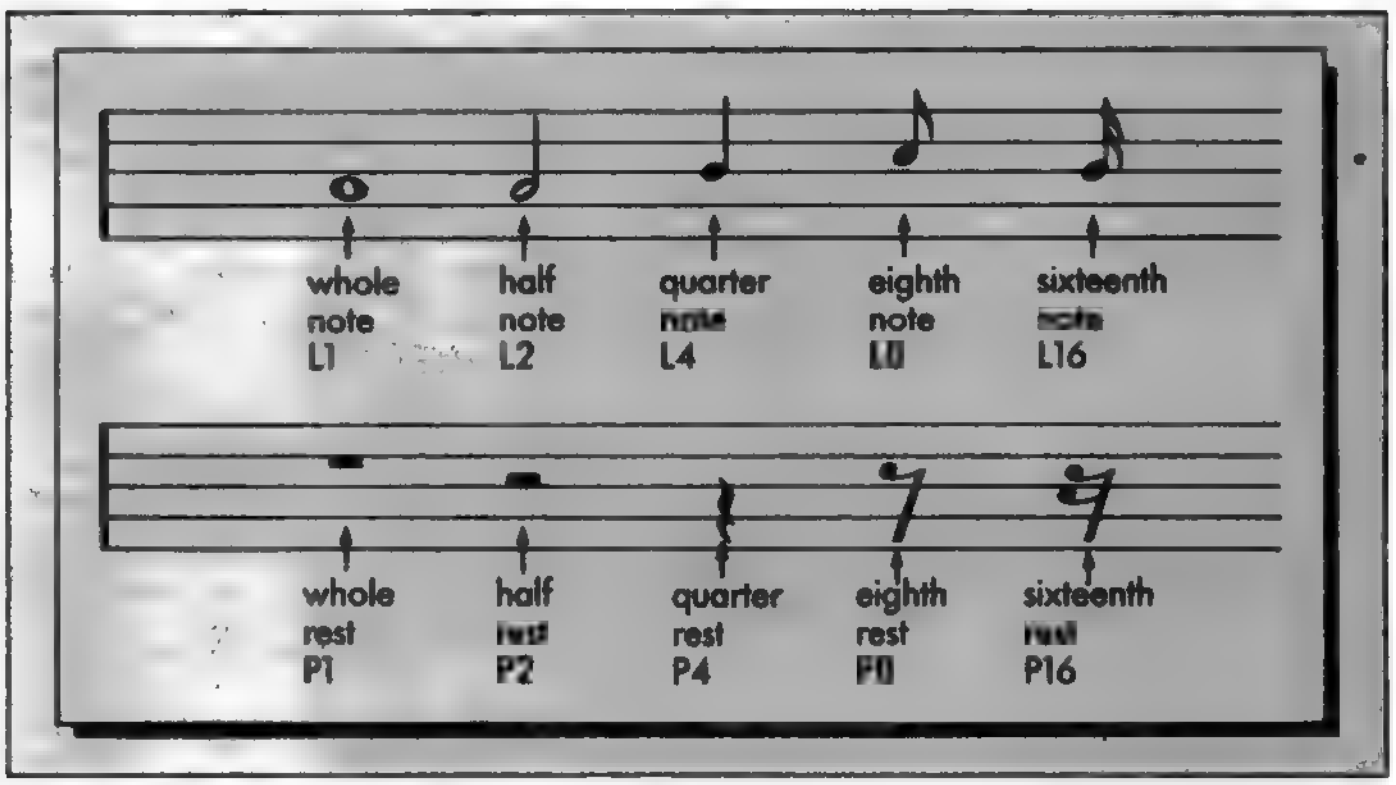


Figure 9: *The conventional representation of note lengths and rests.*

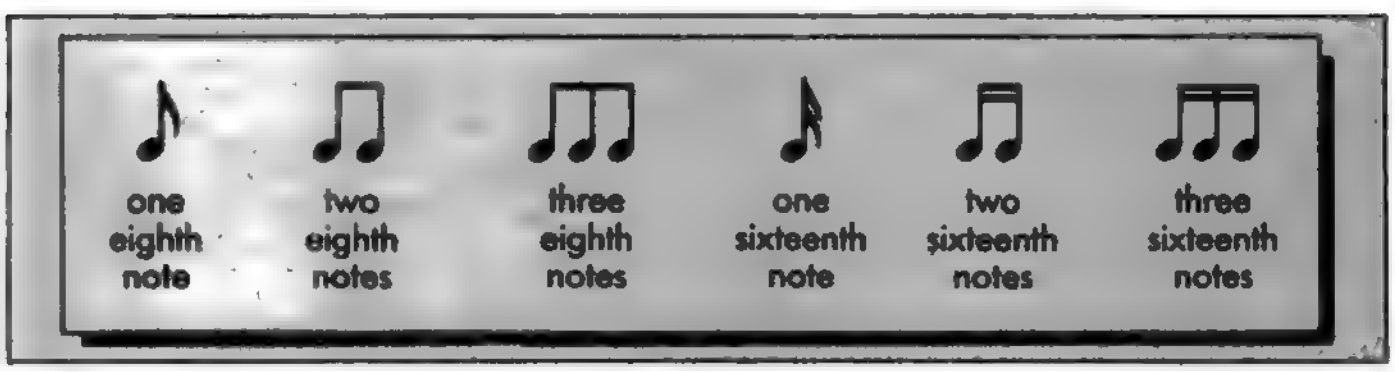


Figure 10: *Linking notes of the same length.*

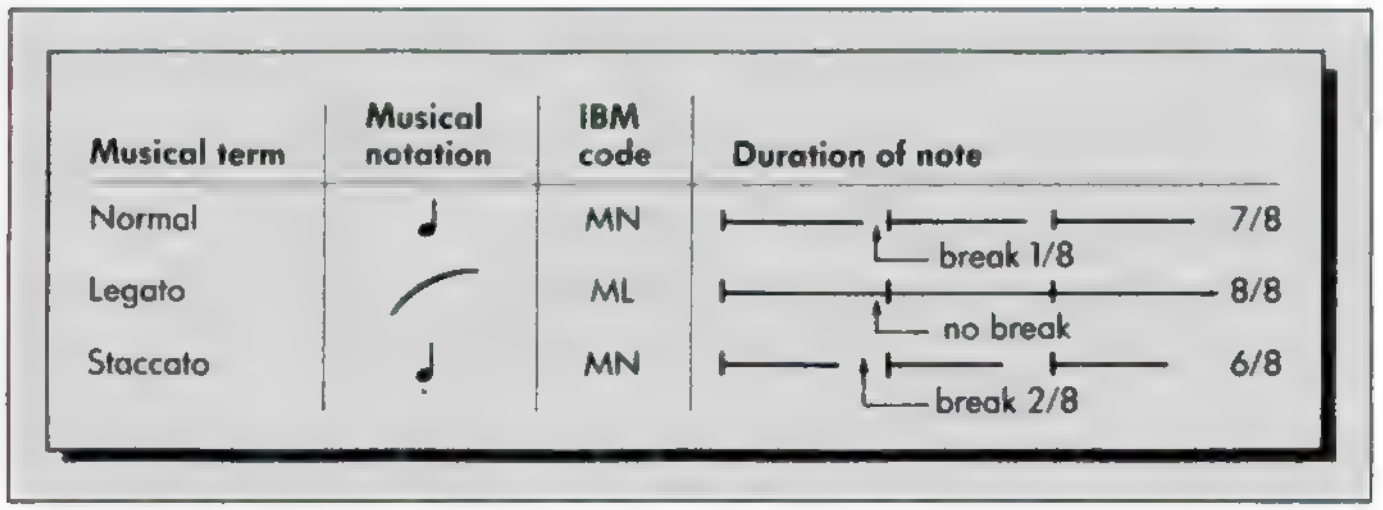


Figure 11: *The duration of notes.*

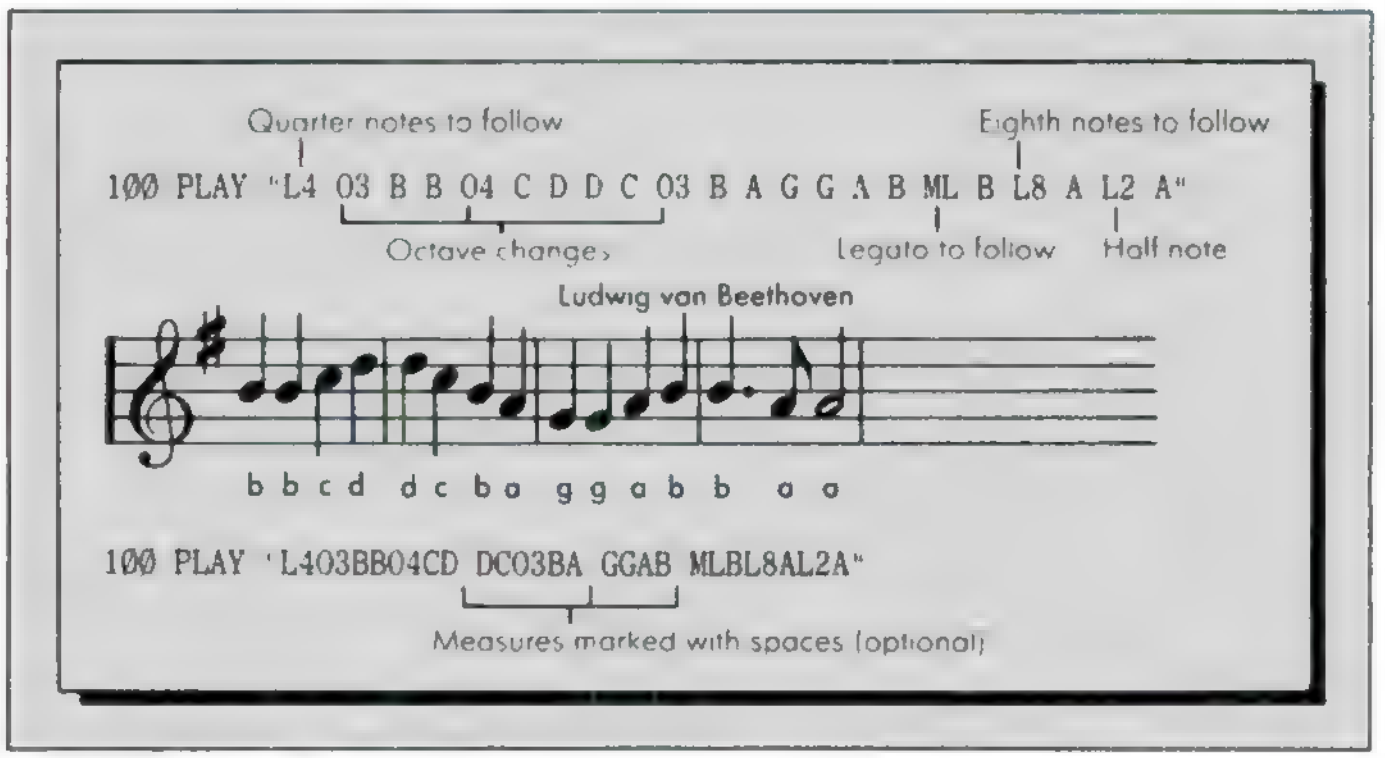


Figure 12: *A line of music translated into BASIC.*

the PLAY statement. Next is the IBM note code, which you may use instead of specifying the octave and the notes (C D E F G A B C). Finally, the seventh column, "Staff location," shows the location of C in that particular octave.

The diatonic scale is old and has been used for music written for small groups of instruments. The tempered scale is newer and is used because a larger number of acceptable combinations of notes is possible when played by many instruments. PLAY is written with the tempered scale; should you prefer to use the diatonic scale, you will need to rewrite your program using the SOUND statement and the frequencies given above. For most purposes, the tempered scale will do quite nicely.

The Play Statement

Now let's take a look at PLAY, the second BASIC sound statement and the easiest way to play music on the PC. Here's an example of the PLAY statement:

```
100 PLAY ''B B C D D C B A''
```

Here the notes to be played are expressed by the letter name. When a note is to be made sharp, it's followed by either + or #. When it's to be made flat, it's followed by −.

For example, if the A in the example above is to be made sharp, you would enter

```
100 PLAY ''B B C D D C B A#''
```

or

```
100 PLAY ''B B C D D C B A+''
```

To make the A flat you would enter

```
100 PLAY ''B B C D D C B A−''
```

The octave notation must be added before the note that is to be played in the new octave:

```
100 PLAY ''03 B B 04 C D D C 03
B A''
```

All notes will be played in octave 3 until a new octave is specified (here octave 4). We have purposely separated the notes with spaces for ease of reading. However, this is not necessary, and the notes may be written in lowercase. (Remember that the letter O is used, not the number 0, to denote the octaves.)

```
100 PLAY ''o3bbo4cddco3ba''
```

Note that the default octave is octave 4. If you do not specify an octave, PLAY will assume that the notes you designate are in octave 4.

Under DOS 2.0, the PLAY statement may use the < and > symbols to change octaves where < signifies "move down one octave" and > signifies "move up one octave."

Figure 8 shows what we get if we try using these symbols in the preceding example.

Notes and Timing

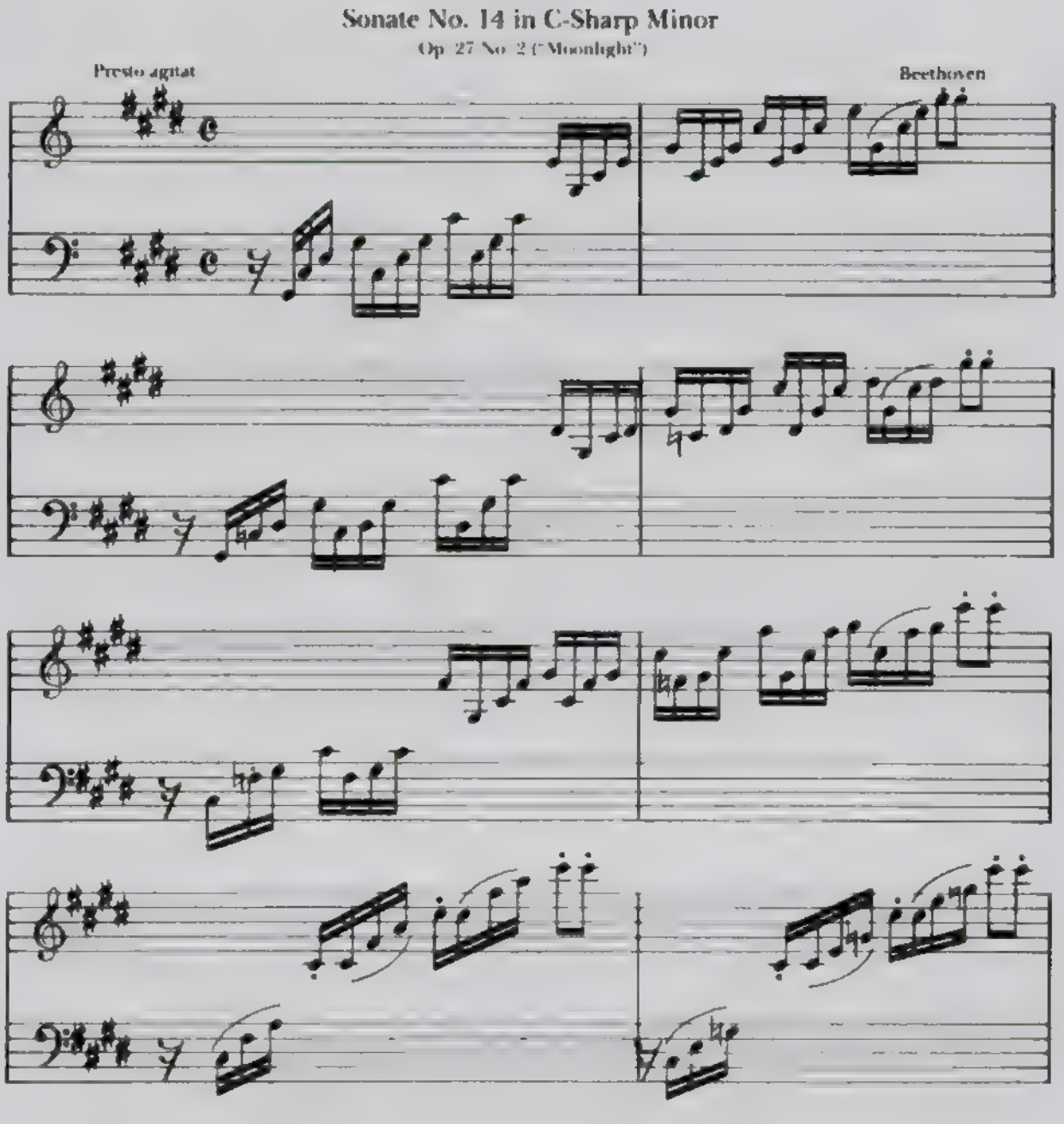
In conventional musical notation, the duration of a musical note is given by an oval shape; the shape may be with or without stems or flags and may be solid or open. (Whether the stem points up or down has no significance). Figure 9 gives some examples of this system of representing notes and rests. A rest, by the way, may be defined as an absence of sound for a specified period.

When two or more notes are the same in duration, it is customary to link or connect their flags together, as shown in Figure 10.

Occasionally it is desirable to make a note longer or shorter than it is normally played. When the note is to be lengthened (played legato) a dot (.) is placed after the note. When a note is played normally, the duration is about ⅞ of the time specified, with a break of ⅛ between notes. When legato is specified, the note is extended to

A Music-making Exercise

Take the following musical passage and encode it with the PLAY statement. The author suggests a tempo of approximately 160 for best definition.



Here is our solution:

```
98 '------SONATA B11-----------
99 '------BEETHOVEN'S MOONLIGHT-------
100 PLAY "MFMNL16T160P1P1"
110 PLAY "O1P16G+O2C+EG+C+EG+O3C+O2EG+O3C+EO2G+O3C+E"
120 PLAY "O3G+C+EG+O4C+O3EG+O4C+EO3MLG+O4C+EMSG+8G+8MN"
130 PLAY "O1P16G+O2CD+G+CD+G+O3CO2D+G+O3CD+O2G+CD+"
140 PLAY "O3G+CD+G+O4CO3D+G+O4CD+O3MLG+O4CD+MSG+8G+8MN"
150 PLAY "O2C+FG+O3C+O2FG+O3C+FO2G+O3C+FG+C+FG+"
160 PLAY "O4C+O3FG+O4C+FO3G+O4C+FG+MLC+FG+O5MSC+8C+8MN"
170 PLAY "O2P16MLC+F+AO3MSC+MLC+F+AO4MSC+MLC+F+AO5MSC+8C+8MN"
180 PLAY "O2P16MLC+EGO3MSC+MLC+EGO4MSC+MLC+EGO5MSC+8C+8MN"
```

—B.E. and B.P.

the full period of time. If the note is to be shortened (played staccato), the dot symbol (.) is placed over the note. Where staccato is specified, the note is shortened to ¾ of the normal time specified, thus decreasing the duration by ⅛.

The PLAY statement provides a number of single-letter and double-letter commands that let you control the tempo of your music and the duration of individual notes.

The letter L indicates the duration of a note. Following the L, a number from 1 to 64 will give the length of note. L1 is a whole note, while L4 is a quarter note, and L16 is a sixteenth note, and so on.

The letter T is used to specify the tempo. T100 means 100 quarter notes in one minute. The tempo may range from 32 to 255. Tempo has a default value of 120; that is, if no tempo is specified through the T command, the tempo will be 120 quarter notes per minute.

The letters ML are used to increase the duration of a note. ML stands for "music legato."

The letters MS are used to decrease the duration of the notes that follow. MS stands for "music staccato."

Finally, the letters MN instruct the PLAY statement to return to the normal duration of note, which is ⅞ of the interval between notes. See Figure 11 for a visual representation of the various note durations. Figure 12 shows an example of a line of music translated from musical notation to BASIC.

The length of a rest in the PLAY statement is indicated the same way as the length of a note. Just as you specify the length of subsequent notes with L followed by a number, you can use P followed by the rest length to specify the length of a rest: P1 for a whole rest, P8 for an eighth rest, and so on (see Figure 9).

The tempo of music is widely referred to in the Italian terms for tempo: for example, *largo* for "very slow". In Figure 13 the typical ranges of both beats per minute and IBM clock ticks are given. The clock ticks are useful when using the SOUND

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order entry	339
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job costing	579
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statement. Knowing the beats per minute is more useful when working with the PLAY statement.

To set the tempo, use the T command in a PLAY string. Follow T with a number

> By using strings and the PLAY statement, you can create some rather sophisticated pieces of music without using too much BASIC code.

for the number of quarter notes in a second. You may select a number from 32 to 255, with 120 being the default value. In our little illustration above, if we wanted to make the tempo andante, then we'd change line 100 as shown in Figure 14. Figure 13 gives a range of values for the various tempo notations.

There are two modes in which you can use the PLAY statement: music foreground mode and music background mode. In the music foreground mode (specified by MF), each note being produced on the speaker must reach conclusion before the next note will start, and no other processes will take place. To interrupt a process, the Ctrl-Break key combination may be used. The foreground command is the default state for both the PLAY and SOUND statements.

On occasion you may wish other processes to continue while some sounds are generated. One such occasion might be to indicate that all is proceeding "well" in a long computing procedure. Under these circumstances, you can put a short combination of notes—up to 32 notes and pauses—into music background mode. Use the command MB, which stands for music background, and your IBM PC's computational processes will be able to proceed while the music is being played. Try this example:

```
10 FOR X = 1 TO 10
20 PLAY "mbmnl16t120"
30 PLAY "o2egbgegbgeg-bg-eg-b
    g-fa#o3do2a#fa#o3d
    o2a#fao3do2afao3do2a"
40 PRINT X, 2*X, 3*X, 4*X
50 NEXT X
```

Tempos		Beats per Minute (Tn) (PLAY)	Clock Ticks (SOUND)
LARGO	=	42 to 66	26 to 17
	=	48 to 92	23 to 12
LENTO	=	50 to 66	22 to 17
	=	50 to 69	22 to 16
	=	52 to 108	21 to 10
ADAGIO	=	50 to 76	22 to 14
	=	58 to 96	19 to 11
ANDANTE	=	40 to 72	27 to 15
	=	56 to 88	19 to 12
	=	80 to 126	14 to 9
MODERATO	=	60 to 80	18 to 14
	=	60 to 126	18 to 9
ALLEGRO	=	63 to 96	17 to 11
	=	69 to 112	16 to 10
	=	72 to 132	15 to 8
	=	84 to 144	13 to 8
VIVACE	=	60 to 84	18 to 13
	=	72 to 92	15 to 12
	=	76 to 112	22 to 10
	=	80 to 160	14 to 7
PRESTO	=	69 to 120	16 to 9
	=	88 to 132	12 to 9
	=	96 to 144	17 to 8
	=	100 to 152	11 to 7

Figure 13: *Tempos and note durations.*

String Variables with PLAY

You can use a string variable to contain the sequence of commands that the PLAY statement is to use. This procedure allows you to repeat a sequence, perhaps even in another octave, without repeating the code for it (see line 180 in the example below). String variables used in the PLAY statement are defined in the usual way. The

only difference is that when you construct the PLAY statement, you should use an X preceding the string to denote the string variable. (See Figure 16 for an example.)

Figure 16 is a more ambitious piece of music, coded into strings. Try it out and see how you do!

As you can see, by using strings and the PLAY statement, you can create some rather sophisticated pieces of music without using too much BASIC code. Try adding some music to your existing programs. You—and anyone else using your program—will love the results!

```
100 PLAY "T90L4O3BBO4CDDCO3BAGGABO4LBLAAL2A"
          |
          tempo
```

Figure 14: *Programming the tempo for andante.*

```
10 A$ = "o3bbo4cddco3baggabb.msamna2"
20 PLAY "P1 XA$;"
          |                    |
          |                    The "." acts as a dotted note; extends duration by 3/2
          Be sure to close the quote
Using the A$ string variable
```

Figure 15: *Using X to denote a string variable in the PLAY statement.*

```
98 '------OP#1.B11---------
99 '----- Amy Petersen's OP #1 ----------------------
100 A$ = "cecececece-ce-ce-ce-dg-dg-dg-dg-dfdfdfdf"
110 B$ = "cegecegece-ge-ce-ge-dg-ag-dg-ag-dfafdfaf"
120 C$ = "cecececececececececececececececece"
121 '      12345678901234567890123456789012345
130 D$ = "egegegegeg-eg-eg-eg-fa#fa#fa#fa#fa#fafafa"
140 E$ = "egbgegbgeg-bg-eg-bg-fa#o3do2a#fa#o3do2a#fao3do2afao3do2a"
150 F$ = "egegegegegegegegegegegegegegeg"
160 G$ = "cecececece-ce-ce-ce-dg-dg-dg-dg-dfdfdfdf"
170 H$ = "cecececece-ce-ce-ce-dg-dg-dg-dg-dfdfdfe4d4c2"
180 PLAY "MFMNL16T120O4XA$;O3XA$;O2XA$;XA$;XB$;XC$;XD$;XD$;XE$;XF$;"
190 PLAY "XG$;XH$;"
```

Figure 16: *A piece of music coded into strings.*

PLAY modifier	Meaning
A - G	Notes with # or + for sharp, - for flats
Ln	Length of note *n* = 1 for whole, *n* = 4 for quarter etc.
MF	Music Foreground
MB	Music Background
MN	Music note length Normal
ML	Music note length Legato
MS	Music note length Staccato
Nn	Play note number *n* (0 to 84) piano notation 0 → rest
On	Octave number (0 to 6)
Pn	Pause length *n*, *n* = 1 whole rest, *n* = 4 quarter rest
Tn	Tempo where *n* is from 32 to 255
Xstring	Execute string
.	Same as dotted note duration of note by factor 3/2

Figure 17: *The meanings of PLAY statement modifiers.*

Summary

We have seen how the SOUND statement may be used to specify a note's frequency and duration. This statement permits the production of nonmusical sounds, or notes not located on the *tempered* musical scale. The format of the SOUND statement is:

SOUND *frequency, duration*

The PLAY statement is the most convenient way to represent the standard musical notes. Figure 17 is a summary of commands used to modify the PLAY statement. ■

Bernd Enders is professor of physics and astronomy at the College of Marin in Kentfield, California. He also teaches introductory computer science and has founded his own company, Starsoft, which produces software for astronomical applications.

Bob Petersen is also a professor of physics and astronomy at the College of Marin. He has a long-standing interest in computer applications and has been using computers in education for almost 20 years.

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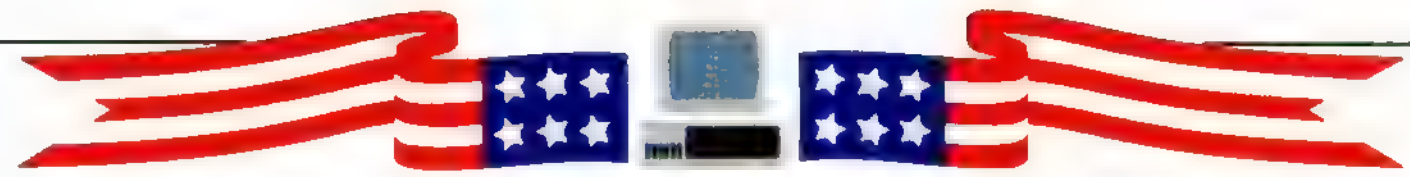
Computers On The Campaign Trail

The PC has thrown its hat into the ring, giving politicians at the state and local levels a chance to put computers to work on their campaigns.

Illustration: Jeffrey Seaver



CAMPAIGN TRAIL

Computers are not strangers to politics. Big computers, purchased with funds from national campaign warchests, have played important roles in shaping and running campaigns since the Republican National Committee bought its first computer in 1975. What is different about political computing today is that, thanks to personal computers and software developed for them, virtually any candidate can afford to put a computer at the heart of his or her campaign. For less than $10,000, and in some cases for as little as a few thousand, a typical candidate can now use a computer to handle such sophisticated political techniques as polling, direct mail, and voter targeting.

State and local politics have become fertile ground for computing for several reasons. To begin with, an incredible number of people run for elected office in this country, some 250,000 every 4 years, for everything from local sewer board chairman to President of the United States. Almost universally, these candidates are spending far more money to get elected than ever before.

The computer makes it possible for candidates to more efficiently raise and spend their money. It has quickly become a coveted tool of campaigners in every party and at every level.

The Front Runner

At least one commercial program, *Campaign Manager*, has been available since last spring. The program received its first favorable reviews from candidates running in 1983 primaries and elections. An insurgent candidate in Stamford, Connecticut, who used the program won the mayoral primary and later the election. The program also had a good response in some races in Babylon, New York, where a well-established party retained power by sweeping party and town posts. In none of these campaigns was the computer the single determining factor, but campaign managers in each case considered it an integral part of their effort.

William Canary, a Babylon councilman, used *Campaign Manager* to coordinate the town's Republican efforts during the 1983 primary. Republican party regulars there were challenged for town nominations and for party committee posts. This year's battle was especially important because party committeemen elect the county chairman—and the head of the Babylon committee wanted to become county leader.

With an IBM PC, *Campaign Manager*, and a letter quality printer, the Babylon Republicans were able to produce up to 60 personalized letters an hour. The group also used the scheduling sections of the program extensively to keep track of candidates and to utilize volunteers more effectively, Canary said. He praised the ease of using the program and said he expected the party to use some of the more sophisticated portions, such as polling and targeting, in future elections.

The computer makes it possible for candidates to more efficiently raise and spend money. It has quickly become a coveted tool of campaigners at every level.

"Every campaign requires good planning, adequate financing, and good execution," said Canary. "The computer assists the organization in proper planning and efficiency." The PC was the centerpiece of the campaign, according to Canary, but he cautioned, "You don't win an election without volunteers and the grassroots. The computer isn't eligible to knock on doors; people knock on doors.

"The computer is only as good as those involved," he added, "men and women who do the programming; volunteers who communicate with the public."

Campaign Manager is selling well across the country as aspiring candidates gear up for the 1984 congressional, state legislative, and local races, say its manufacturers, Aristotle Industries of Norwalk, Connecticut. According to John Phillips, the president of Aristotle, more than 50 campaigns have already used at least some portion of the program, which performs most of the traditional political functions except kissing babies.

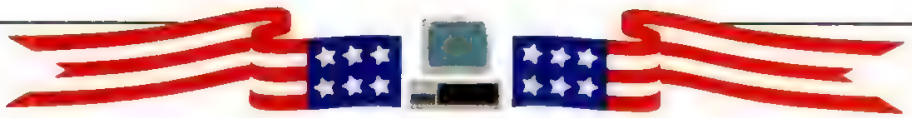
Political Rivals

Campaign Manager is probably the first such integrated political package, but it certainly won't be the last. Q Systems Research of Summit, New Jersey, has recently introduced *Solon*, named for the man generally credited as the father of Greek democracy. *Solon* includes many of the same campaign functions as *Campaign Manager* but goes even further, say its creators, by including features designed to help the winner stay in office.

Solon is a hardware and software package designed to be the complete political aide-de-camp, according to Henry Casaba, product manager at Q Systems. "We think of it as an investment in the political future. Our hope is that the candidate will use this system in terms of an on-going political office, to be responsive to his constituency, to identify the issues, and to track and manage issues that are of real concern."

"With our type of system, you don't have to have a consultant on retainer at $250 a day. If you have a small budget, you can get five or six candidates on the county executive or freeholder level to share the cost."

The expansion of personal computing throughout electoral activity may prove to be one of the most pervasive and deeply felt impacts of the PC on society. In the following articles, we take detailed looks at both *Campaign Manager* and *Solon*, as well as at other ways micros are powering the political process. ■



APPLICATIONS/MARTIN PORTER

The PC Runs For President

Senator John Glenn, with the PC on his ticket, calls himself the high-tech candidate. But nearly all the democratic hopefuls have microcomputerized their campaigns.

In the campaign headquarters of presidential hopeful Senator John Glenn, five IBM PCs are considered valuable members of the staff. They help out with accounting, fundraising, and direct mail. In fact, 1984 may be remembered as the year the microcomputer ran for president. During the last election, the micro was no more than a hobbyist's toy, but this year the PC and its counterparts are muscling in on the presidential race.

Walter Mondale's campaign is armed with Kaypros, many of which do double duty, going on the road with the former vice president and working on office desktops as well. Senator Gary Hart's campaign uses a CompuPro system, and both Glenn's and Senator Alan Cranston's efforts owe much of their computing prowess to Digital Equipment Corporation VAX minis. Even the wire service and newspaper reporters assigned to the campaign have climbed on the bandwagon, filing their scoops on the notebook-sized TRS-80 Model 100.

Former Senator George McGovern's office uses an IBM PC like Glenn's, but his staff was reluctant to publicize that information. "I can only talk to you if you don't mention what machine we use," said one McGovern aide cryptically.

"But I already know that you use an IBM PC," I said.

"Then we can't talk."

We didn't talk.

Guarding Strategies

At first, the Glenn staff was equally cautious. "You see, you only get one shot at this and you don't want to give away your campaign strategies," explained Louisa Dixon, a campaign assistant and former Department of Energy investigator. She designed the office's five-PC system, and eventually she did explain how the computer fits into Glenn's campaign.

Dixon had used an IBM PC in her Washington, D.C., office and she brought it with her when she joined the Glenn campaign. When more machines were needed, PCs were purchased so that

Illustration: Jeffrey Seaver

they could run the software Dixon had designed for a range of bookkeeping, research, and management duties. All software used by the campaign has been developed by the staff—particularly the "small databases" that the Glenn committee is in the process of developing.

Dixon would not be more specific about these databases. She explained that security is a prime concern. "If a central campaign strategy is stored in a computer, I don't want anyone to know where it is." This isn't an irrational fear. Tight electronic security has been part of campaign precautions since Watergate. For this reason, none of the Glenn PCs have communications equipment, though the campaign does rent time on Nexis, the library and clipping service database.

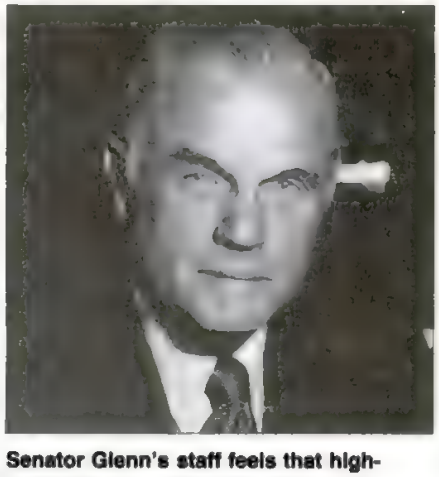
When the Glenn committee was first formed in January 1983, a spokesperson announced that the senator's affection for technology would be reflected by a "high-tech" campaign. Finances, time restraints, and, reportedly, intrastaff disagreements have put a damper on some of these plans.

Nevertheless, the accounting department at Glenn headquarters uses a PC for financial projections, cash flow, and other monetary dealings. The Glenn direct mail operation, which will have shipped over 3 million brochures and letters to voters by the end of the campaign, is managed by another PC. Fundraising also has its fingers on the PC's keyboard, with a catalog of potential donors organized state by state, listing names, business numbers, and addresses. Contributors can thus be quickly contacted when Glenn passes through their towns.

And then there are the databases.

The database about which it is virtually impossible to get information is the one that is being used for delegate selection. The manager of this department flatly refused to be interviewed, although I later learned that his program contains a list of delegates and possible delegates for each state, who is running, and how they stand on the issues. Apparently the Glenn group has a firm grasp on those vital contacts that determine the state primary results.

The campaign also has stationed a PC in its research department where a staff is hard at work setting up a second database, containing the text of what every Democrat and Republican has said about every issue. Much of the information is clipped from news reports, although the committee has access to Nexis. If Glenn wants a full report on Mondale's public position on education, for example, all the relevant public statements and position papers can be immediately accessed and printed via a series of keyboard commands.



Senator Glenn's staff feels that high-technology is appropriate for an ex-astronaut.

The PC is used to organize Glenn's massive direct-mail effort.

Electronic Mail

The PC used to organize Glenn's massive direct-mail effort is managed by Van Schneider, a veteran of Governor Michael Dukakis's 1982 campaign in Massachusetts. (A Datapoint computer is often credited with Dukakis's victory.) In the Dukakis contest, an IBM PC was used strictly in the "issues" department, Schneider reported. As associate director of finance for the Dukakis organization, Schneider used a Datapoint to manage the direct mail program as well as to handle the budget for a ticket that raised $3.5 million.

On the Glenn campaign, Schneider is able to analyze the impact of various delays on the Glenn postal strategy with the help of a PC and a direct mail program. "What happens to your mail program if you run into a snag? Rather than having to do all that analysis by hand, you can have that up on the computer, and you just put in the variables. You can take a 10-million-piece program down to a 2-million-piece program in a matter of moments," Schneider explained.

He confirmed that the Glenn committee originally planned to equip all its state offices with PCs and connect them via phone lines to campaign central in Washington. There was also talk of equipping the road staff with a PC-compatible machine connected with home base, a possibility that hasn't been ruled out. "That's still being talked about very seriously," Schneider remarked.

Again, security was the glitch in a potentially appealing network scheme. Schneider hypothesized, "What happens if the terminal gets into somebody else's hands and somebody gains access to our main computer file? It's like high-tech dirty tricks. It's very, very simple to wipe out somebody's contributor base or information base. Just a simple couple of buttons would have to be pushed."

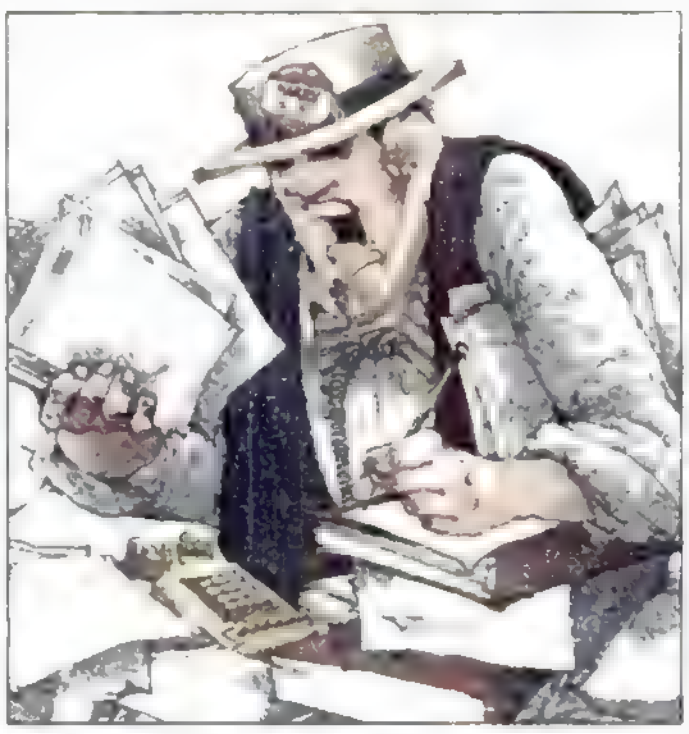
Security considerations may have reduced the scope of the PC's role in the Glenn campaign, but the candidate remains committed to computer technology. "His attitude, it seems, is that technology is not something to be afraid of; it's something to be used and experimented with—to make things better and to make our lives easier," said Schneider. He feels that the former astronaut's stance as the "high-tech candidate" is somehow appropriate. "You have to realize that it was the space industry that helped develop the technology that is putting a PC in everyone's house." ■

Solon: The Political Machine

This upscale hardware and software package is designed to help candidates get into office and stay there.

In many ways, *Solon*, marketed by Q Systems Research Corporation in Summit, New Jersey, is designed as the Cadillac of political programs. With a price tag of $16,500 for the combination of hardware and software, the package is within hailing distance of that luxury driving machine.

"We are looking for something that goes beyond just the campaign trail," said Q Systems president, Thomas E. Dackow. *Solon* is designed to help the winner stay in office. Q Systems is marketing it as the complete political workstation. The program includes such standard campaign features as: voter and contributor targeting, direct mail, candidate scheduling, polling and election district analysis, reporting of campaign finances to the required federal agencies, media and volunteer management. It also adds several features to aid the politician once he is elected. These include a module for tracking legislation through Congress or the State House, a sophisticated spreadsheet component for financial accounting and control, and a modem for telecommunications. The company has begun shipping its first units and is already working on enhancements to facilitate networking and allow multiple users, said Dackow.



Solon
Q Systems Research Corporation
478 Morris Ave.
Summit, NJ 07901
201-522-1774
List Price: $16,500

CIRCLE 742 ON READER SERVICE CARD

A Political Presence

A former analyst for a Long Island political pollster, Dackow has 20 years of experience as a management systems consultant for both commercial and political clients. He formed Q Systems 3 years ago, and expects political consultations to become the company's major source of revenue.

When the company began designing a political package, Dackow envisioned a product capable of handling many functions and quickly processing an extensive hierarchical database. "We wanted a sys-

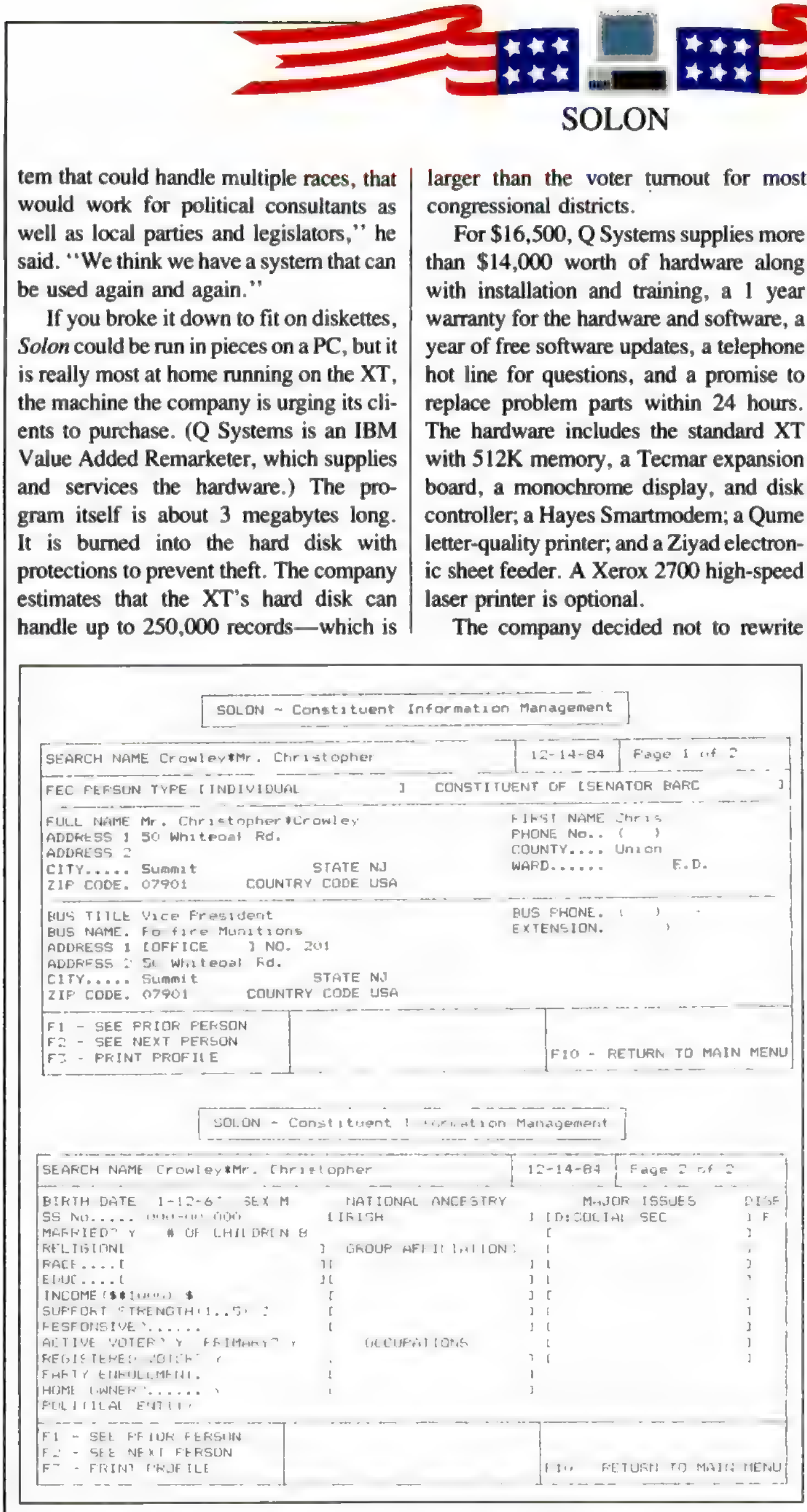
tem that could handle multiple races, that would work for political consultants as well as local parties and legislators," he said. "We think we have a system that can be used again and again."

If you broke it down to fit on diskettes, *Solon* could be run in pieces on a PC, but it is really most at home running on the XT, the machine the company is urging its clients to purchase. (Q Systems is an IBM Value Added Remarketer, which supplies and services the hardware.) The program itself is about 3 megabytes long. It is burned into the hard disk with protections to prevent theft. The company estimates that the XT's hard disk can handle up to 250,000 records—which is larger than the voter turnout for most congressional districts.

For $16,500, Q Systems supplies more than $14,000 worth of hardware along with installation and training, a 1 year warranty for the hardware and software, a year of free software updates, a telephone hot line for questions, and a promise to replace problem parts within 24 hours. The hardware includes the standard XT with 512K memory, a Tecmar expansion board, a monochrome display, and disk controller; a Hayes Smartmodem; a Qume letter-quality printer; and a Ziyad electronic sheet feeder. A Xerox 2700 high-speed laser printer is optional.

The company decided not to rewrite software packages to perform applications that were already commercially available, but to adapt such packages for *Solon*, said Dackow. *Solon* therefore includes Lotus' *1-2-3*, IUS' *General Ledger* and *Accounts Payable* packages, and Hayes *Smartcom II*.

"The way campaigns are won and the way political offices are run are being changed dramatically by computers," said Dackow. "However, there is a tendency to both under and overestimate the power of available technology. While most campaigns and political offices quickly become disenchanted with homegrown programs written on microcomputers in less powerful languages such as BASIC, the alternative is not necessarily a quantum leap to expensive mini and mainframe computers. A business-oriented machine like the IBM PC or XT, coupled with a true database management system, provides a very acceptable solution."



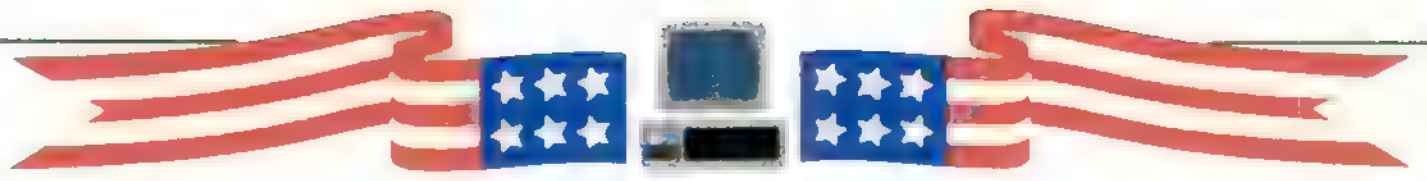
The Constituent Information Management section of *Solon* is the most important for many candidates. It keeps records on voters, contributors, and other important people a candidate or elected official needs to keep track of.

What's New?

Solon performs many of the same functions as other, less expensive programs, yet its degree of integration and its database management system are more sophisticated. It allows, for example, faster and more detailed sorting of records and more complex financial management. But *Solon* is not above providing a friendly touch; the screens include a help menu that identifies the 10 function keys, avoiding the need to make time-consuming treks to the manual.

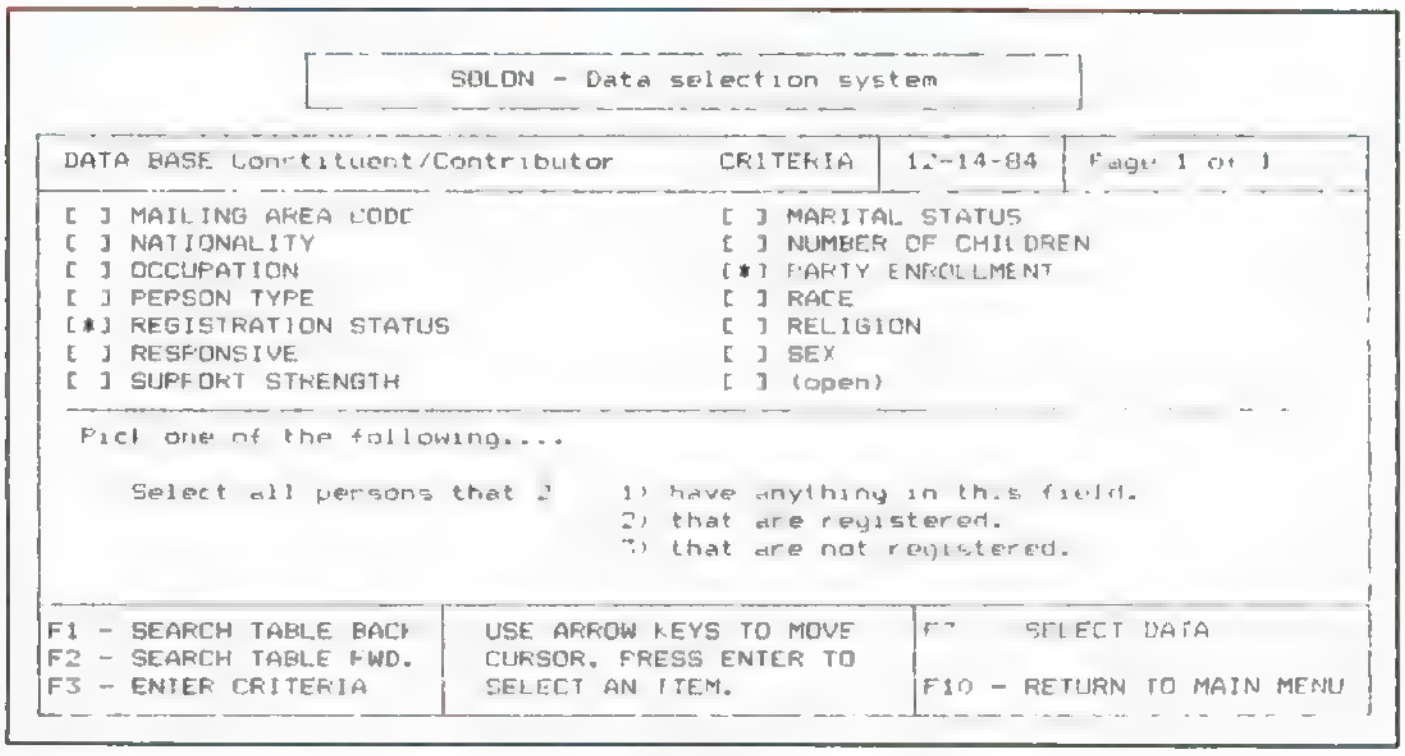
The program starts with a master menu that allows the candidate to choose from its functions. Typically, the first section used would be constituent information, a database that includes names, addresses, and telephone numbers. It also includes key demographics like marital status, income, race, party registration, education, ethnic ancestry, group affiliations, and issues with which the constituent is concerned.

Using this constituent database, the candidate can prepare targeted mailings, or, once in office, answer constituent let-



SOLON

ters while noting the issue on the record for future reference. Another nice touch is an automatic prompt that reminds the candidate to follow up on each letter. *Solon* includes a text editor that satisfies such basic needs as corrections and insertions, though it is not designed for larger word processing tasks such as reports. The program supports one printer, which could be inconvenient. When Q Systems introduces networking and multiuser capability, candidates will be able to use a PC or PC*jr* to run the printer and prepare letters, said Dackow. Networking would also solve some communications problems; many legislators maintain a district as well as a Capitol office and shuffle mail and data between them.



Media placement is a crucial part of any campaign. *Solon*'s Media section keeps track of all relevant information on area media outlets.

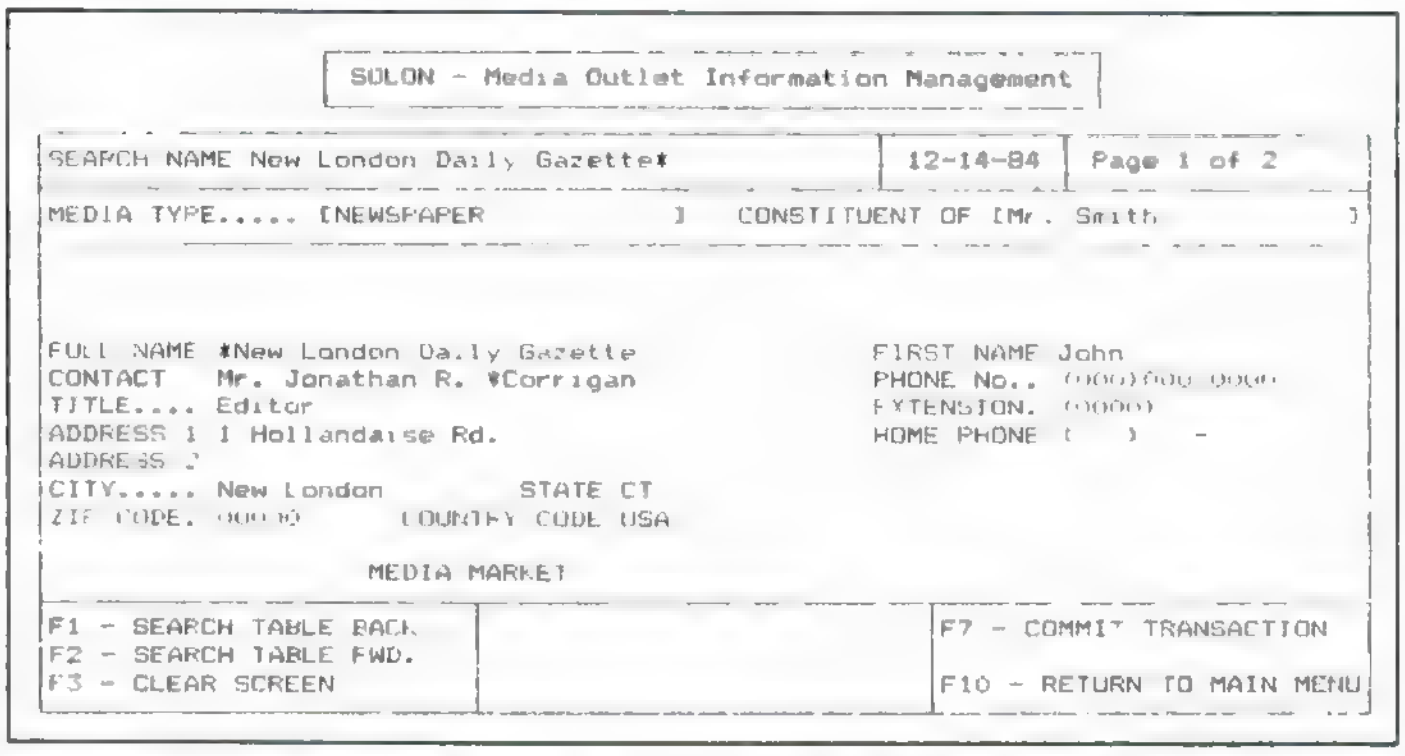
All Sorts of Sorts

The greatest strength of the program is its ability to sort through databases. Candidates can sort records in virtually any combination and to varying degrees of sophistication. The multidegree sort makes it possible, for example, to separate out all political committee members of a given income who are concerned with a particular issue and who are members of a specific fraternal organization. This capability allows one group to receive a different mailing from committee members who are concerned with the same issue, but who belong to a rival fraternal organization.

For fundraising, or for special care of VIPs, convention delegates, and volunteers, the program uses the same type of database management, custom-tailored to suit these functions. For example, the fundraising program will keep track of donations, pledges, and in-kind contributions (federal regulations require that donations of cash and goods be filed separately). This part of the program is integrated to let you produce reports and statements automatically. It also takes note of thank-you letters.

Manipulating the media is a key portion of any campaign. In a statewide race, the issues that concern a weekly newspaper with a circulation of less than 10,000 are often far different from those of a television station serving a large metropolitan area, and a candidate must keep track of all of them. In addition to filing media contacts and storing a record of all press releases, the media module allows a candidate to track media support on key issues, affiliations, and strength of candidate support. Since *Solon* uses the same database program, a candidate can sort by those factors combined with the usual ones such as size and geography.

Solon's data management system is designed to enable the candidate to write or speak as specifically as possible to the audience selected. *Solon*'s district analyses and polling components are designed to weigh information so that the audience can be identified and characterized. While computerized polling won't replace a full-scale professional poll, said Dackow, it can be used to give a fair reading of the impact of a specific issue in a specific area, such as voter recognition of a candidate before and after an appearance. Using past electoral results and the ten mathematical formulas built into Solon, the candidate can evaluate both raw and percentage data for base party strength, swing voters, average party and total voter turn-



A complex and fast database lets the candidate sort the constituent records in many different ways. This is one of the program's greatest strengths.

outs, as well as the average statistical deviations. The program stores data by party but also allows the candidate to combine electoral lines in districts where there are traditional minor party alliances or where the campaign is trying to determine whether it would be worthwhile to establish such ties.

The program includes a campaign calendar for the candidate, key aides, and other staffers. It can print schedules in full by date, or in an abbreviated version. For example, a candidate may wish to separate public and private meetings. The scheduling function is also useful once a candidate is in office, as are other *Solon* functions such as the various financial spreadsheets and cost controls. Because it includes full general ledger and accounts payable packages, *Solon* provides more business functions than some other campaign programs. It processes checks, keeps vendor files, and allows batch control.

Perhaps the most interesting part of the program is the portion that tracks bills. This is usually a cumbersome process; most legislatures have several readings of a particular bill, which can occur in different forums from the committee room to the floor of the house. *Solon* tracks a bill by its number (often different in each house of a bicameral legislature), the committee to which it was assigned, legislative action by date, vote totals, and the bill's fate in the executive. It also includes space for such remarks as who introduced the bill.

There are already available several legislative databases that track bills and that can be read via modem and telephone lines. *Solon* can receive data this way, but an operator will have to manually transfer it to the appropriate part of the program.

With its high price, *Solon* is clearly not intended for someone who decides to take a flyer and run for a town council seat. It may, however, make sense for a central party fielding a group of candidates, or for a county committee that is running both state assembly and senatorial candidates. Because of its large capacity, *Solon* would be most valuable to candidates and office holders at the mayoral level and up. The primary institutional market, according to Q Systems, will be corporations, lobbies, political action committees, and political parties. It's a high-powered system for high-powered users. ■

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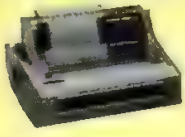

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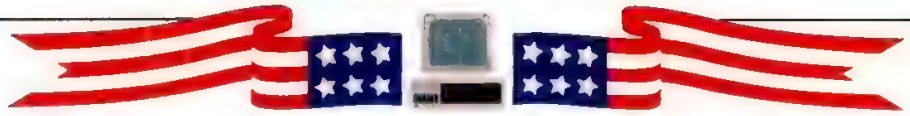


A Victory For Campaign Manager

This program for political contenders helped a dark horse candidate win a Connecticut mayoral nomination.

When the Stamford, Connecticut, Democratic Committee met last August to nominate its candidate for mayor, there was never a question about what would happen. The leaders of the West Side and upscale North End chose a popular councilwoman who would be able to outspend her opponent by better than two to one, with help from the political organization.

But when the final primary ballots were counted in September, insurgent Thom Serrani, a 35-year-old state senator, had captured 60 percent of the vote and easily wrested the nomination away from the better-financed party leaders' choice. Serrani went on to win the November mayoral election by a wide margin ("It was a slaughter," said George Jepson, the 28-year-old lawyer who directed Serrani's campaign). The more spectacular and unexpected victory, however, was the upset in the primary. Though all of the traditional political factors were against him, Serrani had two advantages the party's designee lacked: an IBM PC-XT and a software program aptly named *Campaign Manager*. "When you win that big, it's hard to put your finger on any one specific reason," said Jepson. "If this race had been closer, I would say the computer did it. It's tough to put a numerical figure on what the computer is worth in votes, but I can't think of another factor by itself that was more important."

Campaign Manager
Aristotle Industries
P.O. Box 21
Norwalk, CT 06853
(203) 853-6686
List Price: $499.95
Requires: 28K RAM, two disk drives, PC-DOS.

CIRCLE 710 ON READER SERVICE CARD

Anytown, U.S.A.

You can't mistake the Stamford skyline when you see it from the Connecticut Turnpike. Half-finished buildings with the straight, sleek lines of post-modern architecture rise along the highway. More than a billion dollars of new construction is now in the ground, and corporate head-

quarters worth billions more have been built as the city evolves from a blue-collar economy to one based on white-collar services.

More than 10 percent of the city's population worked in a lock factory in 1954, when the majority of Stamford's residents were still employed in some area of manufacturing. Three decades later, the city has grown to 103,000 residents, an increase of about 25 percent. Most people now earn a living at such corporate headquarters as GE, Singer, Xerox, and Pitney-Bowes.

As in many cities, the Stamford Democratic Party built its first coalition on ethnic groups. But the city's changing economic face changed its demographics and, as a result, its politics. Democrats hold an enrollment edge with 28,000 registered voters, compared to 19,000 for the Republicans. Nearly 8,000 voters have declared themselves Independent of the major parties. But despite the deficit, Republicans have controlled the mayor's office for the past 8 years. The 40-member city council is evenly split between the two parties.

Scrambling for Control

In May, Mayor Louis A. Clapes' decision to retire touched off scrambles within the Republican and Democratic Parties. Stamford City Hall is important to the state political committees. Democrats, who have elected four of the last five governors, run three of the state's five largest cities. But Republicans view Stamford as their own, especially since its transformation into an upscale corporate Mecca and the growth of surrounding Fairfield County into a key corporate suburb.

Thom Serrani had announced his candidacy in May, but he managed to get only five of the 40 city-council votes cast, recalled Jepson, his manager. The poor showing was about what had been expected, given the alliance between leaders of the West Side and the North End. But the Serrani campaign had already made other plans.

"I began thinking about computers last winter," said Jepson, who works for Local 210 of the Carpenters Union and who has been involved in local and state campaigns for more than 5 years. "For direct mail, you have to rely on them."

Thom Serrani, the underdog who wrested the Stamford Democratic nomination for mayor away from the party leaders' favorite.

But Jepson found that the use of computers had gone beyond direct mail. He began looking around at the hardware and software available, and found what he needed at Aristotle Industries, a small company that operates out of the home of John and Dean Phillips in adjacent Norwalk. John, 28, has twice ran unsuccessfully for Congress. Dean, a 26-year-old computer programmer, was his brother's campaign manager. Based on that experience, the pair decided to create a computer program to help candidates. They formed Aristotle Industries 7 years ago, choosing John's middle name as their title in honor of their Greek-American heritage. *Campaign Manager* software hit the market late last spring and has been selling like hotcakes ever since, said John.

"Not every race will need a computer, but we think there will be an enormous market by the 1984 elections. There is nothing I could do on an IBM System 34," John said of the computer he used in his own campaigns, "that I can't do cheaper and easier on the PC-XT."

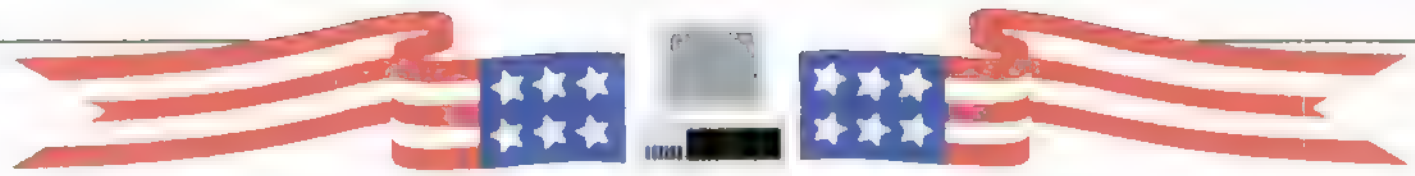
Jepson wanted a program that was simple to operate. "What I know about computers is zero." With the *Campaign Manager* program, "even a novice user like me may make a mistake once, but not twice," he quipped.

An Appetizing Menu

Campaign Manager is a menu-driven program divided into various modules that help to keep track of such key campaign functions as polling, purchasing media, press relations, candidate scheduling, fundraising, campaign budgeting, and treasurer's reports to state and federal electoral monitoring agencies. The software is copy-protected though it allows data files to be copied. It requires at least DOS 1.1, but supports DOS 2.0, an upgrade the company recommends because the program will run faster and store data more easily. The program also supports two printers, which can halve processing time for large loads. Many campaigns, particularly for congressional or state legislative districts, will probably use *Campaign Manager* on an XT. The fixed disk allows sharply increased storage capacity, allowing an entire listing of more than 20,000 campaign contributors to be stored, for example. The IBM compatibles can also run the program, said Dean Phillips, who added that the company has had no difficulty using the Compaq, though some clients have reported problems with other models.

After consulting computer experts, Jepson decided on the PC-XT configuration because of its larger capacity and its compatibility. He plans eventually to use the database in other state campaigns. The cost factor also influenced him. Even with the software, he was able to start operations for less than $6,000. "The software is so cheap, especially if you're going to spread it out over more than one campaign. The costs are trivial, almost incidental, considering you're building a database."

Written in BASIC and then compiled in machine language, the program begins



CAMPAIGN MANAGER

with a master menu that lets you initial the diskette to be used, set up printers, and format backup disks to move data between drives. Getting into the program requires a date, time, and a password, included for security reasons, to log on.

After you log on, the main menu appears. Eleven of 12 options correspond to specific campaign functions; the twelfth is a return to DOS (see Figure 1). Typically, the first function used in campaigns is the master file, essentially a database that stores records composed of various fields. The master file keeps track of contributors and voters (see Figure 2).

The Master File

In addition to the usual entries of name, address, occupation, and phone number, the program includes space for up to eight special codes that can be assigned by the campaign. In the Serrani campaign, the master file was first used to solicit contributions. For such fundraising, the record also includes a grid with space for amount of contribution, date, and type of election, and room to note which form letter has been sent to each contributor. The program's prompt line allows the user to choose from among six form letters to be mailed. The form letter chosen automatically reads the master file so that campaign thank-yous as well as solicitations can be individualized.

Using voter and contributor lists from other campaigns, the Serrani forces sent out three fundraising mailings: a general introduction letter in June, another mailing in July, and a third one in August. There were additional fundraising letters for the general campaign, using lists of Democratic contributors who backed Serrani's opponent during the primary, but who, in time-honored tradition, were urged to unite for the good of the party.

The master record is designed to work with the sort and select module as well as with the direct mail module. For example, a campaign may want to sort voters according to such factors as ethnic group, age, and sex. Symbols assigned in the initial coding of the eight fields allow those special factors to be noted and later used by the interactive sorting program to pull, for example, all black, 25-year-old women voters from a specific district. The sort can also produce direct mail either alphabetically or by zip code, a handy technique to speed delivery. It can also automatically sort by size of campaign contribution to create targeted mailings to large contributors, for example.

Isolating the Issues

The Serrani campaign used the sort to keep track of voters and issues as well, said Jepson. In most campaigns, the bulk of the contact with voters is through telephone banks, where volunteers contact and interview a potential voter about such concerns as handguns, education, and the environment. The Serrani campaign identified five separate local issues. During the telephone drives volunteers asked voters questions and then recorded the answers, coding each file entry according to issue. By sorting through the codes, the campaign was able to target its mailings so that a voter concerned about, say, education received a mailing reflecting Serrani's position on that issue. That database of voters was also used for follow-up telephone calls and eventually to help get out the vote.

"Asking voters what they thought was important and unique for Stamford," said Jepson. "By coding for housing or education, we could send out a letter within 72 hours thanking them for talking to us. Through the computer, we were able to give very direct feedback to people in response to the things they were interested in. Later in the campaign, everybody who had been identified as undecided got another letter, a personal letter, with more issues information," he said.

"On one level, you can argue that it is

```
        CAMPAIGN MANAGER MAIN MENU


   1    MASTER FILE
   2    SORT/SELECT RECORDS
   3    DIRECT MAIL
   4    TREASURER'S REPORT
   5    SCHEDULING
   6    RESEARCH FILE
   7    CAMPAIGN BUDGET
   8    POLLING
   9    TARGETING
   10   MEDIA BUY
   11   PRESS RELEASE
   0    EXIT - RETURN TO DOS


  SELECT ONE ?
```

Figure 1: *Campaign Manager's main menu offers 11 options and a return to DOS.*

```
                    CAMPAIGN MANAGER - MASTER FILE

LAST NAME : Phillips_____________
FIRST NAME: Dean_________________                  TEL(H): 2038536686
SALUTATION: Dean_____________________              TEL(O): 8002434401
MAIL NAME : Dean Phillips____________              CODES : EE IG GA ________
ADDRESS   : 3 Outer Road_____________
CITY      : Norwalk_____ STATE: CT ZIP: 06854

EMPLOYER  : Aristotle Ind._____                    ZDDDDDDDDDDDDDDDDDDDDDDDDD?
OCCUPATION: V.P._____________                      3        NOTES          3
                                                   3 This guy has big bucks__3
SOURCE   AMOUNT    DATE      ELECTION  LTR SENT    3 He is a V.I.P._________3
flf      10000.00  09/04/83  GEN       A           3 ________________________3
glg      __200.00  10/17/83  CON       B           3 ________________________3
___      _____.__  __/__/__  ___       _           3 ________________________3
___      _____.__  __/__/__  ___       _           3 ________________________3
___      _____.__  __/__/__  ___       _           3 ________________________3
___      _____.__  __/__/__  ___       _           3 ________________________3
___      _____.__  __/__/__  ___       _           3 ________________________3
___      _____.__  __/__/__  ___       _           3 ________________________3
___      _____.__  __/__/__  ___       _           3 ________________________3
___      _____.__  __/__/__  ___       _           3 ________________________3
___      _____.__  __/__/__  ___       _           @DDDDDDDDDDDDDDDDDDDDDDDDY

 1thankA 2thankB 3ltr.1 4ltr.2 5ltr.3 6ltr.4 7DELETE 8RESTAR 9EXIT  0SAVE
```

Figure 2: *A typical master file entry with data and notes on a campaign contributor.*

manipulation," he continued. "If you write to the teachers, you talk about education. On the other hand, it does allow us to speak more particularly to whatever interests people."

Once the master file and the sort codes are established, a campaign can use the direct mail function to print a new letter, revise an old letter, or print envelopes or labels. The text editor included in the package can't compete with sophisticated word processors, but it includes all of the usual functions needed to produce, correct, and format a letter. It also includes automatic headings, the ability to merge parts of different documents, and centering lines to aid layout.

Strategic Information

These three programs—master file, sort, and direct mail—allow a campaign to keep track of its fundamental tactical requirements: securing adequate funding, identifying voting blocs and issues, and communicating with supporters. However, most campaigns are won or lost on the strategic level, where decisions are made on who are the potential voters and where they are located. For this task Jepson used the software's polling module.

Next to advertising, polling is generally the single most expensive outlay in a campaign. For a small city like Stamford, a good one-shot poll can cost as much as $6,000, said Jepson. Fees for follow-up polls, telephone calls, and subsequent analysis can cost even more, putting polling out of the reach of most local candidates.

Campaign Manager functions essentially as a number cruncher for the poll. First, the campaign decides what area is to be polled and then looks up its telephone prefix. The program will then generate a list of random telephone numbers. The user chooses the sample size, which depends on the number of voters in the area. Volunteers can then call those numbers and ask as many as 64 multiple-choice questions. Each answer is coded and entered into a data record.

Once the data is recorded, the program can print out a breakdown of all the answers by absolute number of responses and by percentage of the whole. In addition, the program can segregate groups that answered the same question with the same answer. This is called identifying response groups, and the technique is used in cross-tabulating results so that the campaign can determine its strength among women, for example, or among those who said they were most likely to vote.

> Voters who were identified as undecided got a personal letter with more issues information.

Concentrating Resources

"You can get incredible flexibility," Jepson said of the polling segment. "You can sit there for hours and decide how you want to break down the city, geographically or demographically or whatever." Using its own telephones, the Serrani campaign conducted its only poll in June. That poll data was "one of the big factors" in deciding how to concentrate forces in the campaign, said Jepson. For example, the poll showed that Serrani had strength in a district along the shoreline,

```
                    CAMPAIGN MANAGER - TARGETING


PRECINCT -          PRECINCT 1
AVERAGE TURNOUT..................................... 78.523%
AVERAGE PERFORMANCE FOR YOUR PARTY'S CANDIDATE..... 54.962%
LIKELY TURNOUT THIS ELECTION.........................  1,178
PERCENT OF THE VOTERS WHO ARE PERSUADABLE........... 14.250%
NUMBER OF VOTERS WHO ARE PERSUADABLE.................    168
LIKELY NUMBER OF REGISTERED NON-VOTERS OF YOUR PARTY.....  118

MY ANALYSIS INDICATES THAT YOU SHOULD CONCENTRATE ON PERSUASION IN THIS AREA
```

Figure 3: *The program's targeting module analyzes data on a specific area and suggests a strategy.*

```
                    CAMPAIGN MANAGER - SCHEDULE          CURRENT
                                                         10-17-1983
                                                         13:33

DATE       :07-02-83
EVENT      :JULY 4TH PARADE
LOCATION   :MAIN STREET
ARRIVE     :11:00 AM AM/PM
LEAVE      : 2:00 PM AM/PM
SPONSOR    :TOWN FATHERS
CONTACT    :MAYOR GREENE
TELEPHONE  :2039495959
STAFF      :JOE, SAMMY, MARIUSH, AND SARAH
DRIVER     :SARAH
CAR        :BELGRANO
SUPPLIES   :TABLOIDS, LAPEL PINS, BALLOONS
PRESS Y/N  :Y
SPEECH     :OUR AMERICAN HERITAGE
V.I.P. s   :MAYOR GREENE, SENATOR BODD
NOTES      :THIS ONE WILL BE A PIECE OF CAKE, TRY TO BE NICE TO BODD.
DIRECTIONS:YOU KNOW HOW TO GET THERE


1PREV   2NEXT   3       4       5       6       7DELETE 8MENU   9EXIT   0SAVE
```

Figure 4: *The scheduling option keeps track of significant details about upcoming campaign events.*

an area the campaign originally thought was a swing district. The campaign was able to save resources they had planned to spend there for use elsewhere, yet Serrani still carried the city's shore area along the Long Island Sound.

In addition to its number-crunching ability, the polling section can also be used for what-if analysis. "It's easier than having a poll done outside," Jepson said. "You don't have to send the data out and wait for it to come back. Once the stuff is in there, you can decide how to break it out. You can try a variation. Instead of just the West Side, you can say, well, let's try all of the districts in a different area." By playing with the data, Jepson said, he decided what districts were winnable and how to concentrate resources.

The program won't replace professional pollsters, said Dean Phillips, who added that *Campaign Manager*, like any program, is only as good as the data. "It doesn't replace the intelligence of the person running it," he said. "He's got to make up a good questionnaire. The questions have to be valuable."

CAMPAIGN BUDGET TITLES:	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	TOTAL
INCOME:						
CASH-ON-HAND BEGINNING	$1,000.00	-$3,104.45	$37,915.55	$40,685.55	$33,423.55	$1,000.00
PACS	$5,000.00	$3,000.00	$3,000.00	$3,000.00	$3,000.00	$17,000.00
LOANS	$4,500.00	$5,000.00	$0.00	$0.00	$3,000.00	$12,500.00
EVENTS	$10,000.00	$32,000.00	$12,500.00	$13,400.00	$23,090.00	$90,990.00
RAFFLE	$550.50	$500.00	$500.00	$500.00	$1,000.00	$3,050.50
RALLIES	$0.00	$3,200.00	$450.00	$340.00	$2,400.00	$6,390.00
PARTIES	$3,000.00	$5,400.00	$13,400.00	$21,000.00	$24,500.00	$67,300.00
DIRECT MAIL	$2,000.00	$4,000.00	$6,000.00	$8,900.00	$12,000.00	$32,900.00
FINANCE COMMITTEE	$7,500.00	$2,400.00	$0.00	$0.00	$0.00	$9,900.00
PERSONAL SOLICITATIONS	$7,500.00	$2,300.00	$4,600.00	$360.00	$3,476.00	$18,436.00
LOCAL PARTY	$500.00	$120.00	$0.00	$0.00	$4,565.00	$5,185.00
COUNTY PARTY	$500.00	$0.00	$0.00	$500.00	$2,200.00	$3,200.00
STATE PARTY	$1,000.00	$500.00	$0.00	$470.00	$240.00	$2,210.00
NATIONAL PARTY	$2,500.00	$500.00	$670.00	$468.00	$2,500.00	$6,638.00
OTHER-1	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
OTHER-2	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
OTHER-3	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
TOTAL INCOME:	$45,550.50	$56,015.55	$79,035.55	$89,623.55	$115,394.55	$276,699.50
EXPENSES - OVERHEAD:						
RENT-CAMPAIGN HEADQUARTERS	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$5,000.00
RENT-STOREFRONTS	$0.00	$0.00	$0.00	$500.00	$500.00	$1,000.00
XEROX MACHINE	$350.00	$350.00	$350.00	$350.00	$567.00	$1,967.00
COMPUTER	$5,000.00	$0.00	$0.00	$0.00	$0.00	$5,000.00
SOFTWARE	$499.95	$0.00	$0.00	$0.00	$0.00	$499.95
PHONE DEPOSITS	$1,000.00	$0.00	$0.00	$0.00	$0.00	$1,000.00
PHONE CHARGES	$250.00	$250.00	$250.00	$250.00	$350.00	$1,350.00
SALARY-CAMPAIGN MANAGER	$2,000.00	$2,000.00	$2,000.00	$2,000.00	$2,000.00	$10,000.00
SALARY-PRESS SECRETARY	$1,500.00	$1,500.00	$1,500.00	$1,500.00	$1,500.00	$7,500.00
SALARY-OTHER	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$5,000.00
SALARY-OTHER	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
SALARY-OTHER	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
UTILITIES	$0.00	$0.00	$350.00	$0.00	$0.00	$350.00
INSURANCE	$100.00	$0.00	$100.00	$0.00	$100.00	$300.00
TRANSPORTATION	$500.00	$500.00	$500.00	$500.00	$500.00	$2,500.00
OTHER-1	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
OTHER-2	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
SUBTOTAL - OVERHEAD	$13,199.95	$6,600.00	$7,050.00	$7,100.00	$7,517.00	$41,466.95
EXPENSES - COMMUNICATIONS:						
POLLING	$8,000.00	$0.00	$5,000.00	$5,000.00	$0.00	$18,000.00
CONSULTANTS	$3,000.00	$3,000.00	$3,000.00	$3,000.00	$3,000.00	$15,000.00
DESIGN	$2,500.00	$0.00	$0.00	$0.00	$0.00	$2,500.00
TV PRODUCTION	$10,000.00	$0.00	$0.00	$5,000.00	$0.00	$15,000.00
RADIO PRODUCTION	$2,500.00	$0.00	$0.00	$0.00	$0.00	$2,500.00
PRINTING	$5,890.00	$0.00	$0.00	$0.00	$2,567.00	$8,457.00
POSTAGE	$0.00	$2,500.00	$0.00	$3,000.00	$5,000.00	$10,500.00
TV BUY	$0.00	$0.00	$10,000.00	$15,000.00	$50,000.00	$75,000.00
RADIO BUY	$0.00	$5,000.00	$5,000.00	$5,000.00	$25,000.00	$40,000.00
PRINT BUY	$0.00	$0.00	$0.00	$2,500.00	$7,800.00	$10,300.00
BILLBOARDS	$0.00	$0.00	$5,000.00	$5,000.00	$5,000.00	$15,000.00
BANNERS	$1,000.00	$0.00	$0.00	$0.00	$0.00	$1,000.00
YARD SIGNS	$1,000.00	$0.00	$0.00	$0.00	$0.00	$1,000.00
PARAPHERNALIA	$565.00	$0.00	$0.00	$0.00	$0.00	$565.00
PHONE BANK	$0.00	$0.00	$2,300.00	$4,600.00	$5,700.00	$12,600.00
RESERVE	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$5,000.00
OTHER	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
SUBTOTAL - COMMUNICATIONS	$35,455.00	$11,500.00	$31,300.00	$49,100.00	$105,067.00	$232,422.00
TOTAL EXPENSES:	$48,654.95	$18,100.00	$38,350.00	$56,200.00	$112,584.00	$273,888.95
CASH-ON-HAND:	-$3,104.45	$37,915.55	$40,685.55	$33,423.55	$2,810.55	$2,810.55

Figure 5: *Campaign Manager's spreadsheet program in action. It can read the master file to help prepare treasurer's reports.*

> The program can estimate the likely turnout in the present election.

Target Practice

Another option allows the user to target (see Figure 3) specific voters. The results of four previous elections (data which is readily available from most municipal Boards of Election) are entered, and the program divides them among ten categories ranging from total registration to average turnout by party based on past performance. Using that information, which is reported by precinct, the program can estimate the likely turnout in the present election and project the percentage of voters who can be persuaded to support a given candidate. The program will rank each district according to any of the ten criteria, so that the campaign can look at a district and determine whether a large number of the voters cross over and hence are likely targets. By playing with the data, a campaign can also discover that a particular district has a generally low turnout and may be ripe for such tactics as a voter registration drive or a specialized advertising campaign.

To help candidates who are buying their own media, the program includes a module that analyzes the impact of radio

and television advertising. Each station is listed by name, type of audience, spot cost, and cost per 1,000 listeners or viewers. That type of data is usually available from media advertising departments. The program will then analyze the market to help the candidate decide, for instance, that the campaign should advertise on a radio station that has a large audience during normal commuting times (cost per 1,000 listeners is cheapest at these times). Because of a low budget that included only a few newspaper ads, the Serrani campaign didn't need the media purchasing portion of the program, said Jepson.

The media-purchasing section of the program's accompanying documentation contains the nicest touch in an otherwise arid, though clear, manual. "Because you are placing your own media buy," the manual states, "you can ask (demand) from the radio or TV station the 15 percent discount normally given to advertising agencies or media buyers. . . . Also be sure to specify that you want the station's political rate, which is normally far less than the normal advertising rate." That bit of advice is designed mainly for campaigns that will not be aided by consultants. It illustrates the fact that neither the program nor the documentation are primers in how to run a campaign; both assume a degree of political sophistication. Aristotle Industries does, however, maintain a hot line to support its software.

Other Options

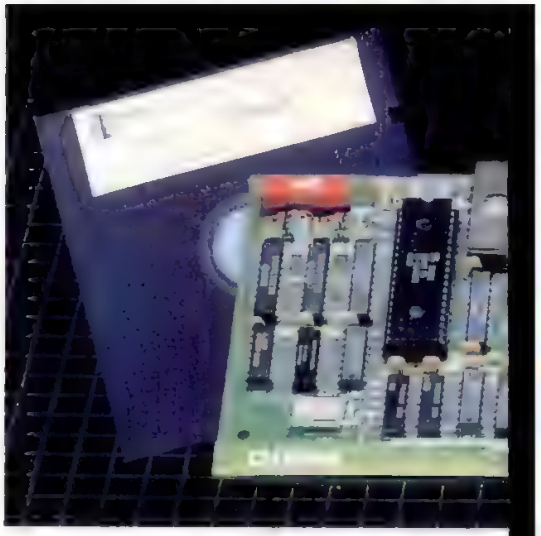
Campaign Manager's other options facilitate the creation of press releases, research on the candidate's and opponent's previous positions, and scheduling. The scheduling section can print a daily summary of all events, or of those selected just for the press. It also lists such things as the key contact at an event, whether to bring campaign buttons or bumper stickers, and even directions to the event (see Figure 4). They may sound superfluous, but such minor details, if left unattended, end up costing time, money, and eventually votes.

To handle numerical functions, and aid campaign budgeting, the program includes a spreadsheet (see Figure 5). It also supplies an integrative program that can read the master file to help prepare treasurer's reports. The reporting program is designed to conform to the present Federal Election Commission standards, which may be different from those in some states. Customizing the program to reflect state reporting is easy, however, said Dean Phillips.

Preliminary feedback shows that most campaigns use the direct mail, sorting, and master files most often.

Campaign Manager has a few minor shortcomings. For example, the polling, targeting, and media purchase modules are not integrated; campaign workers must manually cross-reference that data. If the poll discovers that a particular issue is important to a particular group, that information has to be carried by the operator from the polling to targeting programs and then to the media section. In addition, the press release program doesn't "read" the research. Although integration would be helpful, these difficulties are easily surmounted by using printouts. Nor is complete integration needed, according to John Phillips. Past users of the software reported that they used only certain portions in their campaigns. The preliminary feedback shows that most campaigns use the direct mail, sorting, and master files most often. Because of the separated modules, a campaign can just use the parts it needs, Phillips said.

Aristotle Industries is already working on graphics and communication enhancements for the program. All it really needs now is to learn how to smoke cigars. ■

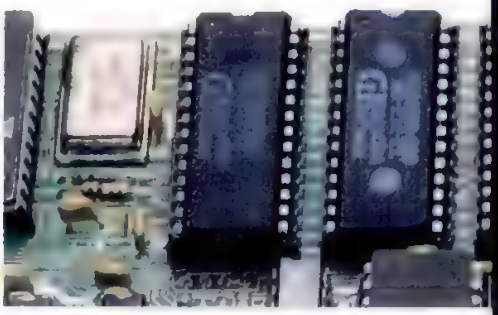


Flip the pages. You see PC modem cards with fewer features advertised for as much as $599. Up until now that's how much it cost to make a modem capable of transmitting at 120 characters per second (1200 baud). It doesn't take a computer to figure out the savings in phone line charges when you communicate four times faster than the 30 character per second modems (300 baud). Now you can have the solution to your communication needs at an affordable price.

SEE HOW THEY WORK

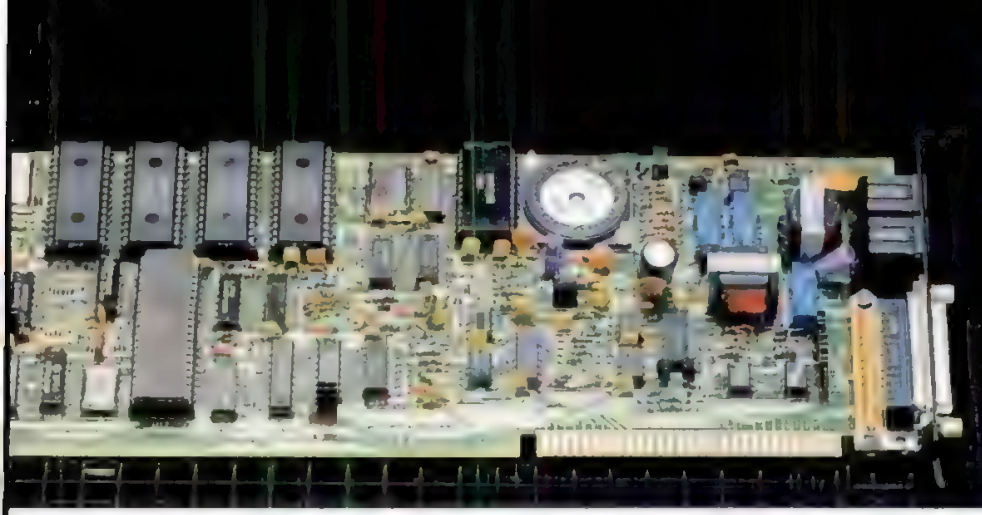
You can image how precise the components have to be to convert tones over a phone line into 120 characters every second. Precision equates to cost. With the advent of the mass market in personal computers the economies of scale drove the costs of manufacture down, but did not effect the precision required. The technology used is called "analog filtering". It is the process of sending (modulating) and receiving (demodulating) tones with perfect pitch. A lot of adjusting, noise suppression, and a little magic is required. Real expensive. Some use lots of chips and filters (known as discrete components). The latest rage is LSI (Large Scale Integration) technology. Which is the same old analog stuff condensed onto fewer chips.

ADVANTAGE #1
Digital Signal processing



A NEW IDEA

We took a different approach. Through the use of four microprocessors the tones are chopped up digitally and measured millions of times per second, eliminating the need for analog circuity. Two microprocessors do the modulating, two the demodulating. The chips are programmed to emulate the 103 (30 characters per second) or 212 (120 characters per second) standards and determine the correct speed automatically. It's a proven technology that provides outstanding performance. Best of all, it's inexpensive and reliable.



$299 212A

1200 Baud, Auto-Dial, Modem for IBM PC

PC 212A/1200:

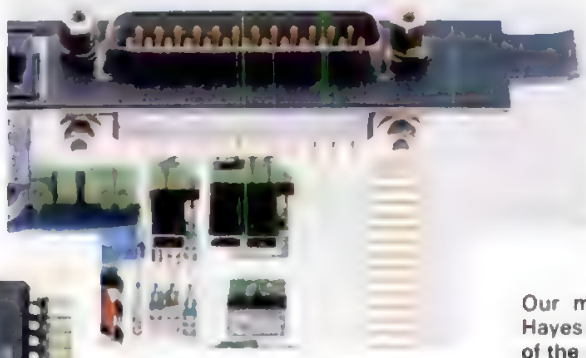
A GENUINE BREAKTHROUGH

NO CORNERS CUT

We included every feature you would want in a modem card. It's FCC registered for direct connection to your modular phone jack with the cord which is included. There is a separate modular jack for your telephone or you can listen through the onboard speaker. The auto-dialer works on rotary lines, tone lines, or a combination of both, and will pause for use with Sprint or MCI. It will work in originate or auto-answer modes. A separate microprocessor, a Z8, controls all the functions.

ADVANTAGE #2

Optional external serial port connector



AN ASYCHRONOUS ADVANTAGE

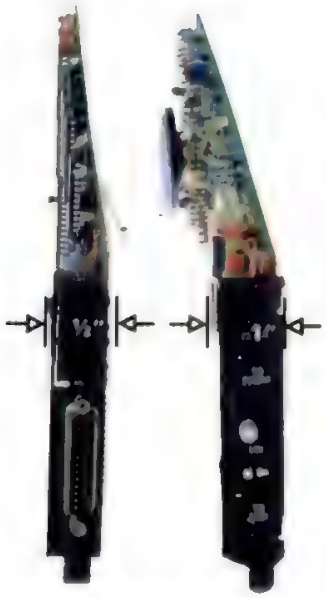
The modem board is addressed in the software as COM1 or COM2 and we have a handy little option you ought to consider. If you would like to use the asynchronous communications port when your modem is not in use, we will add a connector and the necessary circuitry for just $20. This saves you the hundred bucks or so you would spend for another async card and saves a valuable slot. It can be configured as COM1 or COM2 and works just like IBM's does.

THIN IS IN

It plugs into your IBM PC or XT and occupies any one slot since it is just 1/2 of an inch thick. This is made possible by using a special speaker which is just 1/8" tall. Competing brands either use a convential cone type speaker, or they just skip the speaker altogether. Some modems also have large transformers which allow rob valuable space.

ADVANTAGE #3

Just one slot in PC or XT



LET'S TALK SOFTWARE

Our modem is 100% compatible with the Hayes software commands so you can use any of the popular communications packages like IBM's Asynchronous Communications Support, CrossTalk, Transend, or PC Modem. We go one better than the competition. We include PC-TALK III. PC WORLD magazine referred to it as "the benchmark that other PC communications packages are measured against." It stores phone numbers, handles setting the modems characteristics, saves to disk files, transmits from disk files, even binary files. You can program up to forty keys to have things like passwords and log-on information be entered when you hit them. And to make sure data is sent and received accurately, the XMODEM protocol detects errors caused by poor line quality and automatically retransmits the data.

WHY BUY FROM US

Because besides having the best product on the market, we stand behind it and you. You get factory direct technical support after the sale. If an any time during the one year warranty period your modem should require service, we will fix or replace it within 48 hours.

Notice also there are no hidden charges in our price. Nothing extra for credit cards or COD charges. We even pay UPS shipping. If you still are not convinced, and are ready to buy another brand of modem, ask them if they will take our acid test.

THE ACID TEST

Qubie gives you a 30 day satisfaction guarantee on your modem. If you are not completely satisfied we will refund the entire amount of your purchase including the postage to return it. If you can, get anyone selling one of our competitor's products to give you the same guarantee. Buy any modem you like and return the one you don't like. We know which one you will keep.

ORDER TODAY

It's easy to order by mail or by phone.

VISA

BY PHONE: Call us and one of our sales staff can answer any questions you have and take your order. Have your Visa or Mastercard number handy when you call.

(805) 987-9741

BY MAIL: We need your name and street address, daytime phone number, how many modems you want, and whether your computer has single or double sided drives.

$299 includes: PC 212A/1200 auto-dial modem card, PC-TALK III software, cord to connect to modular phone jack, and manual. 1 year limited warranty.

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CIRCLE 153 ON READER SERVICE CARD

Computing In The Public Interest

By organizing their mailing lists, creating databases, and telecommunicating, public interest groups are using computers to bring information to the people.

Antiwar protestors of the 1960s were scornful of the appeal found on computer punchcards of the day: "Do not fold, spindle, or mutilate." Although social activists are still concerned about such issues as loss of privacy and individualism through the computerization of society, this antipathy toward high tech hasn't stopped some public interest groups from installing computers in their offices. For example, some 50 such organizations have joined the Public Interest Research Association, a year-old Washington, DC, organization that provides support services to nonprofit public interest groups that use or are thinking of using microcomputers. Four of these groups, the Washington, DC branch of the American Civil Liberties Union (ACLU); the Americans for Democratic Action; the California Public Interest Research Group; and the Citizens Against Nuclear War, purchased microcomputers during the last half of 1983.

Taking Liberties

While the national ACLU has been using computers for some time now to handle its membership and financial records, the local offices have only recently been acquiring less expensive equipment for word processing.

Hilda Thompson is the administrative director for the ACLU's Washington, DC branch, which oversees the organization's legislative activities. Her office recently acquired a Televideo 808 microcomputer system, which Thompson said that she had been looking into obtaining for some time now. "Two years ago, when I first thought that having a computer in the office for word processing and such would be useful, the cost was much higher than it is now. There's been much more competition in the micro market, and so prices are coming down. And, of course, microcomputers are much more powerful than they were," Thompson explained.

While they had some professional help in choosing a system, once the purchase was made the ACLU staff found themselves on their own. "I helped install it," Thompson said, "And then I picked up the manual.

"We share a basement with our affiliate office, which installed a word processing system before we did. So the staff in this office would go over there and open up the manual to figure out how to use *WordStar*. When our machine came in,

we'd give short, early morning lessons to the staff on how to use it.

"One of the nice things about *WordStar*," she continued, "is I found that even after only four lessons, I was able to enter a 30-page document. I probably could have edited it more quickly if I'd been further along in my training."

The ACLU staff members are also using their new system for list management with a *dBASE II* program. They can keep track of the 3,000 to 4,000 grass roots lobbyists around the country who are actively involved in ACLU issues. One of the major tasks of the micro will be to help coordinate a Bill of Rights lobby effort by locating key activists, aiding in telephone tree and letter-writing work, and keeping staff members abreast of the issues. "This will revolutionize the way we do our work," Thompson concluded. "In combination with our lists on Congressional and Senate voting records, it will help us enormously."

The Americans for Democratic Action (ADA) is a liberal political action organizing and education group that had been maintaining its membership list through a computer service bureau. The staff began looking into in-house membership maintenance because, according to national director Leon Shull, "we would have better and more rapid control of our list."

But once the staff began thinking about office computerization, the other advantages that a micro could bring to their organization became apparent. "It would make it possible for us to track legislation from the moment it's introduced until its final disposition," said Shull. "We get a lot of calls from our members around the country, and they all want to know what's happening with a piece of legislation. It's easy enough to have that information stored.

"We also publish the granddaddy of all voting records—at least, if you want to know what liberals are thinking. We can enter those votes we're interested in, and then at the end of the year play it out, print it, and use it."

Shull said that ADA could also use the computer to keep track of its members' interests and concerns and to follow the voting records of congressional members.

The national ACLU has been using computers for some time.

The organization bought a microcomputer last summer, and Shull has already seen a difference in his work. "It's like a quantum jump into a new world," he said. "Initially, people on the staff were scared to death of it, and the supervisor had to make them do it. But after they'd worked on it for an hour or two, you couldn't get them away from it."

Into the 21st Century

"Public interest groups like ours," said Harvey Rosenfield, "scrape for every penny that we can get. Typically, our offices don't even have electric typewriters. It became obvious to us that we're in the nineteenth century while everyone else is moving into the twenty-first.

Rosenfield is staff attorney for the California Public Interest Research Group (CalPIRG), a university-based consumer and environmental organization. CalPIRG, like other PIRG groups around the nation, establishes itself on university campuses through referenda of the student body, after which it receives its funding from student tuition fees. Student volunteers then operate the chapter with the help of a few salaried professionals.

The group is run mostly by people in their early twenties who are generally more open to new technology than their older counterparts. But they also have a good deal less financial backing. So, when CalPIRG decided that it would be nice to have a few micros, the group didn't actually buy them: It persuaded Apple to donate them.

"We actually asked Apple for something different," said Rosenfield. "It usually provides networks to unaffiliated organizations in a community. We asked it to broaden its vision." As a result, CalPIRG found itself with a provisional, open-ended loan of five Apple II micros.

Once the organization had the computers, it was time to get additional software and peripherals to turn them into a viable network. The list of eventual acquisitions includes Corona hard disks, Hayes modems, software from MicroPro and Ashton-Tate, and Epson printers. However, the assortment of bits and pieces caused some problems. "We've got some of the best equipment made," said Rosenfield. "The only problem is, some of the hard disk drives don't understand the Apple V80 boards, so we're patching things right and left. But it's only another interesting educational part of the process," he added philosophically.

The five micros will be used to connect CalPIRG's branch offices. Before, said Rosenfield, "Each chapter would do things by hand—correlate thousands of bits of information on a big, white piece of paper that takes up a wall somewhere. Now each chapter just plugs the information into the database that we've created, and the information is shared throughout the state."

One of the first projects that will utilize this new network is what Rosenfield called the CalPIRG "Voting Index." The organization will compile a "score card" for every legislator in Sacramento, including voting records and campaign contributions. CalPIRG is planning to not only print this score card, but to try to make it available online to people around the state.

Rosenfield believes that these computer networks could expand CalPIRG's activities to an unprecedented level. "Ultimately, we'd like people to have access to consumer information through their TV sets. If the future of the home computer is to be interactive with the television set, eventually consumers should be able to

dial up our database on their TV sets and we could give them information on all the important consumer legislation pending in Congress.

"I think what we're talking about is a tool that will allow citizens to communicate better with one another," he concluded. "It will increase the cohesiveness of our society and, perhaps provide a means for citizens to recapture the political system—which right now is left mostly to politicians."

No-Nuke Computers

Alongside well-established organizations like the ACLU and ADA, newer groups such as the Citizens Against Nuclear War (CANW) are rapidly joining the ranks of micro users as well. CANW, which has been in existence for little over a year, evolved in response to the recent nuclear freeze movement and acts as a central organizing point for some 54 national membership groups from environmental, professional, and religious movements. Richard Kinane, the legislative liaison for CANW, said, "We've been talking about the need to add word processing and database management to our operation almost from its inception."

They finally decided upon an IBM Displaywriter with Textpac 4 and Reportpac. "It's really dynamite!" Kinane said. "We had maintenance problems with the printer, and IBM's response was excellent. The problem occurred on a Thursday. Friday morning we had a person here to analyze it, and before noon Monday morning the system was back up and has been operating perfectly since."

Like most of its fellow organizations, CANW purchased its equipment primarily for word processing and list management, but also plans to apply it to a number of other activities. "We'll be using it to prepare materials for the upcoming Citizen's Congress on National Security," reported Kinane, "So we'll be working under a fair amount of time pressure to turn out a good quantity of professional material. We have to send out materials to several hundred people, and without the word processor there's just no way we would have been able to maintain our workload without adding several people to the staff."

Kinane is also on the board of directors of another public interest organization, one that deals exclusively with computers. The Public Interest Computer Association (PICA) was formed in April 1983 by Marc Rotenberg. Its purpose is to help public interest lobbies adjust to computerization.

Rotenberg, who began college as a social philosophy major at Harvard, started taking computer courses in his sophomore year. After spending 2 years as a teaching fellow in computer science, he began looking for other ways to apply his talents.

"I came down to Washington a little over a year ago to work for an organization called the Center for National Security Studies, which is a project of the ACLU and the Fund for Peace. They had a microcomputer that they wanted me to take a look at, and I helped set that up," Rotenberg said.

"I found that a lot of other organizations in the Washington area were very interested in developing microcomputer applications. It seemed appropriate to try to set up some kind of operation to provide support services to nonprofit public interest organizations using micros."

Bridging a Gap

PICA sponsors a wide variety of activities for those groups, including programming classes; one-day workshops in particular applications; and monthly seminars on areas such as privacy, health hazards, access to information, and job displacement as they relate to computers. Rotenberg also puts out a bimonthly publication called *Nexus* that reviews application work and explores the impact of many of these social issues.

Apparently, PICA and Nexus are filling a definite need in the public interest community. Rotenberg said that response to PICA has been quite enthusiastic. PICA, with its 50 or so organizational members, has reached the point where it no longer searches for clients but must instead find time for all those who request its services.

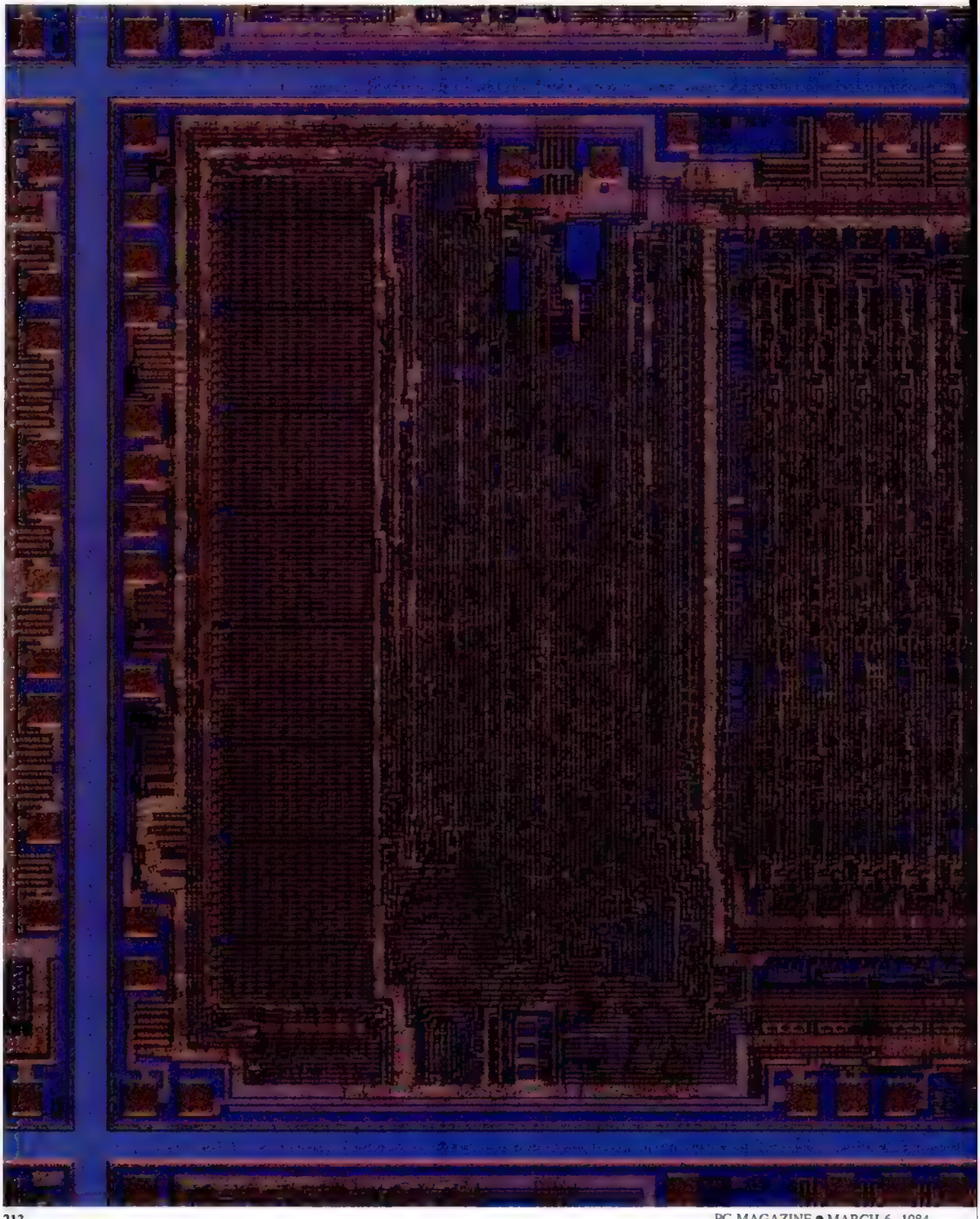
Rotenberg is very familiar with the problems that can occur when a computer is introduced into an organization for the first time. "If an organization is not prepared for it, there are going to be problems with the staff. If you haven't been careful about evaluating your needs and establishing reasonable expectations, there are going to be problems with the implementation. If you haven't got a good dealer or good equipment, there are going to be problems with the system, even if you did everything else right.

"In some instances," he added, "People have unrealistic expectations about what they may be able to do with their mailing list on a microcomputer. Without proper preparation and a sense of how large that list is, you can find yourself with a lot of names and no real good way of managing them.

"There are probably a fair number of nonprofit groups, particularly smaller ones, that may not necessarily benefit from microcomputers. We're trying to fill a gap between the people who are interested in microcomputer applications and the people who are interested or concerned about the effects of computer technology on day-to-day issues."

Inexpensive, sophisticated personal computers are clearly a boon to public interest lobbies trying to stretch limited resources. An interesting question is whether these groups will manage to avoid the politically questionable uses of computers that social activists have objected to in the past.

CalPIRG's Harvey Rosenfield thinks they will. "The important thing," said CalPIRG's Harvey Rosenfield, "is that these organizations won't just repeat what others have done. Our hope is that a computer network will be created that is really of, by, and for the people." ■



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Used in many home computers, the 6502 can address up to 64K bytes of memory and add two 8-bit numbers in about a millionth of a second.

BOOK EXCERPT/STAN AUGARTEN

An Illustrated History Of The Chip

Smaller than a Fabergé miniature, the chip is a true engineering marvel. Its story is told in a new book, State of the Art.

Excerpted from the book State of the Art *by Stan Augarten, published by Ticknor & Fields, New York, a Houghton Mifflin Company. Copyright © 1983 by Stan Augarten. Reprinted by permission of the publisher. This excerpt is the first of three to be run by* PC *in three successive issues. As the photographs in this and future installments will show,* State of the Art *is beautiful enough to be a coffee-table book. As the introduction included in this installment demonstrates, it is also a book to be read. Filled with historical details and technical tidbits related to the integrated circuit, it leads with skill and clarity to an appreciation of the chip's rare beauty and unique scientific significance.*

To see a World in a grain of sand,
And a Heaven in a wild flower,
Hold Infinity in the palm of your hand,
And Eternity in an hour.

—William Blake

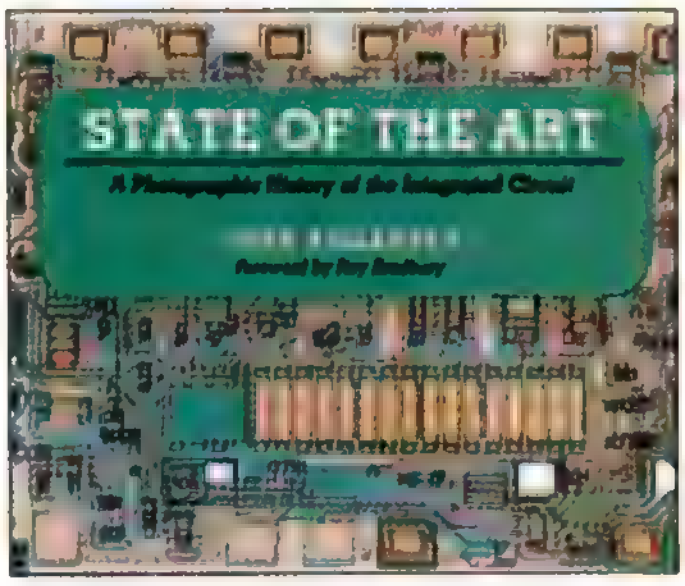
State of the Art is the story of the IC [integrated circuit]—of how it was invented, how it works, how it is made, and how it is used. The story is almost entirely an American one, since the chip was invented in the United States and until recently was manufactured almost exclusively here. The semiconductor industry is centered on a stretch of land between San Francisco and San Jose, California; alive with intellectual energy,

nouveau wealth, and capitalist ambition, the area has come to be known as Silicon Valley. Major IC companies are also located in Texas, Arizona, New York, Massachusetts, and other parts of the country. Nevertheless, [American predominance is being challenged]; other nations, particularly Japan, have recently begun producing chips in bulk, and they will no doubt eventually contribute to the ongoing development of the IC—one of the most important and, as the photos in this book demonstrate, beautiful inventions of the twentieth century.

The Language of Electronics

Most electronic machines, including all computers, speak a common language: binary math, in which all numbers, no matter how large, are representd as a combination of ones and zeros. There are no other digits, and, surprisingly enough, no others are needed. In the binary system, a one is represented just as it is in the decimal system—as simply a 1—but a two is written as 10, a three as 11, a four as 100, a five as 101, and a six as 110. At eight, the number lengthens to 1000, and at sixteen it expands once again, to 10000. Seventeen is expressed as 10001, eighteen as 10010. Cumbersome for human use, binary notation is ideal for electronic equipment, because any number may be expressed as a string of on and off electrical impulses—a sort of Morse code for computers. . . .

In the nineteenth century, a brilliant British mathematician by the name of George Boole devised a system of algebra, or mathematical logic, capable of determining whether a statement is true or false. The statement must first be reduced to a true or false proposition, then subjected to simple logical operations governed by truth tables—arrays of simple formulas that manipulate numbers in accordance with fixed rules. Since almost any problem can be reduced to a series of true or false, yes or no propositions, Boolean logic can be used to perform an almost endless variety of [mathematical and logical] chores, including addition.



State of the Art: A Photographic History of the Integrated Circuit
Stan Augarten
Ticknor & Fields
New York; 1983; xvi, 80 pp.
hardcover; $17.95

CIRCLE 714 ON READER SERVICE CARD

In the late 1930s, Claude E. Shannon, an uncommonly precocious graduate student at MIT, had a historic insight: he realized that the simple rules of Boolean logic made an ideal operating system for computers, then in the early stages of development. With its yes or no, true or false statements, Boolean logic was the ideal mathematical mate for binary math, whose ones and zeros could be made to stand for the black-and-white dichotomies of Boolean algebra. Shannon showed that both binary math and Boolean logic can be mimicked by electronic circuits arranged to shuttle on and off pulses along Boolean pathways. In Shannon's day, these circuits were made out of electromechanical gadgets known as relays, which physically opened and closed like trap doors.

Regardless of what they're composed of, the circuits that carry out Boolean algebra are called logic gates. Logic gates are marvels of mathematical economy, only three types of gates, called AND, OR, and NOT, being needed for a computer to perform almost any logic or arithmetic operation, including the addition of one and one. Each gate has a specific function, such as converting a binary one into a zero or vice versa. In a very real sense, computers are composed of nothing more than logic gates stretched out to the horizon in a vast numerical irrigation system operating close to the speed of light. . . .

Transistors

[In the first truly electronic computer, the ENIAC (circa 1945), logic gates were composed of vacuum tubes rather than electromechanical relays.] Tubes were much faster and cheaper than relays . . . and they were also noiseless; but tubes had problems of their own [and were eventually replaced by transistors]. . . . The transistor is a solid-state version of the tube, able to turn on or off in a fraction of a second and, in the process, greatly amplify an incoming electrical signal. Unlike a tube, however, it does these things without the help of coiled wires, metal plates, glass capsules, or vacuums. . . .

The first transistor, the point-contact transistor, was invented by physicists John Bardeen and Walter Brattain at Bell Telephone Laboratories in 1947. Three years later, their colleague William Shockley developed the junction transistor, a vastly improved model that made the transistor commercially viable and launched the electronic revolution. For their pioneering work, all three scientists won the 1956 Nobel Prize in physics.

To understand how the transistor and its descendant, the IC, work, we must first examine the atomic structure of silicon (the early transistors were fashioned out of germanium, but nowadays they are almost all made of silicon, which is somewhat easier to insulate electrically).

It is the crystalline form of silicon, which has a lattice-like atomic structure, that is used to make transistors. Normally, there are four electrons in the outer shell of each silicon atom, but in the crystalline state each atom shares these four outermost electrons with its immediate neighbors. Therefore, each atom in a silicon crystal actually has eight, not four, electrons in its outer shell. In its natural con-

dition, however, crystalline silicon is too rigid to conduct electricity, which is why [the expedient of] doping is necessary.

As the scientists at Bell Labs discovered, silicon can be doped with impurities to enable it to carry an electric charge. The most commonly used dopants are boron, with three electrons in its outer shell, and phosphorus, with five. When a phosphorus atom is inserted in a crystal of silicon under the right conditions, the newcomer will displace a silicon atom without disturbing other atoms in the vicinity. There will be a slight change in the crystal, however. That extra electron in the outer ring of the phosphorus atom won't be able to find a home in the crystal's interatomic bonds, and it will languish, like a wallflower, in the neighborhood of the phosphorus nucleus.

If more phosphorus atoms are introduced into the crystal, more silicon atoms will be shoved out, and the crystal will gain still more free electrons. And electrons carry a negative charge. So if we now apply a negative voltage across the crystal, all those loose electrons will be propelled through the material, like spare change put to good use. (Voltage, by the way, is a measure of electromotive force. It is to electricity as pressure is to water.)

In the case of boron, the other dopant, which has only three electrons in its outer shell, it's not an extra electron that's brought to the crystal but a positive ion, or hole—the lack of an electron. When a positive voltage is applied, the hole passes through the crystal like a bubble through water.

The first transistor, the point-contact model, had two principal drawbacks: it was somewhat unpredictable and difficult to make. These problems were overcome with the development of the junction, or bipolar, transistor. The junction transistor is a kind of electrical sandwich that comes in two forms: a central layer of boron-doped silicon between two layers of phosphorus-doped silicon, or the other way around. (Again, the first junction transistors were made out of germanium.)

To understand how the transistor and the IC work, we must first grasp some definitions. Boron-doped silicon is known as p-type silicon, because it conducts positive ions. Phosphorus-doped silicon is called n-type silicon, because it mobilizes negatively charged electrons. A junction transistor consisting of a layer of p-type silicon between two layers of n-type silicon is referred to as an npn transistor. (There are also pnp transistors, but we won't discuss their operation here.) The inner layer is called the base, the outer layers the emitter and the collector. These terms are perfectly apropos, since the emitter issues electrons, the collector collects them, and the base supervises the whole affair.

> In a very real sense, computers are composed of nothing more than logic gates stretched out to the horizon.

To operate a junction transistor [see Figure 1] we need only apply a positive voltage to the base and a higher positive voltage to the collector; the emitter must be wired to a ground (a circuit that dissipates electricity). Two things will happen when we turn on the electricity. The positive ions of the p-type base will be repelled by the positive voltage into the negatively charged emitter (but they won't penetrate the collector, because it is receiving an even higher positive voltage). Meanwhile, the electrons respond to a different drummer. Lured by the positive voltages of the base and the collector, they rush out of the emitter, through the base, and into the collector. As they flow through the device, their ranks swelled by the extra electrons in the doped emitter and collector, they become a huge horde and push out of the transistor through the positive terminals attached to the base and the collector.

In a well-designed transistor, nearly all the electrons complete the journey from the emitter to the collector, amplifying the current (the flow of electrons) applied to the base by at least a hundredfold. Amplifications, or gains, of as much as a thousand or more are possible under certain circumstances. Even a tiny boost in the base's voltage—again, the base is the controlling component—greatly amplifies the current.

In general, transistors have two entirely different applications. In so-called analog devices—radios, televisions, and the like—they serve primarily as amplifiers (hence the term *transistor radio*). But in digital equipment—computers, calculators, video games, and so on—they also function as switches, turning on or off millions of times a second in response to the true or false, yes or no, conducting or nonconducting impulses of binary math. Incidentally, the transistor's amplifying properties serve it well by allowing it to be switched on with very little energy and yet still yield a high output.

The Lilliputian World of the IC

A single, self-contained transistor is called a discrete component. Throughout the 1950s and early 1960s, electronic equipment was composed largely of discretes—transistors, resistors (which retard the flow of electricity), capacitors (which store it), and so on. Like cookies cut from molds, discretes were manufactured separately, packaged in their own containers, and soldered or wired together onto masonite-like circuit boards, which were then installed in computers, oscilloscopes, and other electronic equipment. Whenever an electronic device called for a transistor, a little tube of metal containing a pinhead-sized speck of silicon had to be soldered to a circuit board. The entire manufacturing process, from transistor to circuit board, was expensive and cumbersome.

Enter the IC. Instead of packaging discretes in separate containers, engineers found a way to install any number of them on the same piece of doped silicon. The transistor, in other words, ate its tail. A circuit board made up of discretes is like a chessboard composed of large, separate squares that have been glued together; an IC, on the other hand, is like a tiny board that has been imprinted with a checkered pattern. Modern ICs only a fraction the size of a typical discrete contain hundreds of thousands of transistors. ICs are not only smaller than discretes, they are also much cheaper, more reliable, flexible, and faster.

The making of ICs is perhaps the most precise and exacting process in industry. It is a slow, painstaking affair, prone to error at every step, and it begins with the creation of a cylinder of raw crystalline silicon. Such cylinders are usually grown to order by one of the many specialty firms catering to the semiconductor industry. The growing process resembles the making of candles, with cylinders that are from two to five inches in diameter and eighteen inches long (although sometimes they are as long as four feet) being pulled slowly out of vats of molten silicon.

Once they have been delivered to the semiconductor firms, the cylinders are sliced with a diamond saw into wafers less than four thousandths of an inch thick and are polished to a mirror-smooth finish. A five-inch wafer, the largest now in use, is big enough for as many as five hundred chips. . . .

Once the overall design of a chip has been validated by computer simulation, engineers divide the layout into small, easily manageable blocks of circuitry and refine and simulate them repeatedly. When these blocks have been pefected, and the chip design as a whole has been tested down to the last transistor—an enormous task in some cases, since advanced ICs today contain up to five hundred thousand components—the computer generates master blueprints.

Because an IC may consist of as many as fifteen layers, each laid down in coordinated stages, the computer must turn out a blueprint for each stage. These blueprints (which don't really resemble blueprints but are actually finely detailed color drawings) may range from four to five hundred times the actual size of the chip and enable engineers to check for errors. Some computers are even programmed to do their own checking.

If the design works, the computer produces a tape of the IC's layout, which is then fed into a pattern generator. This machine creates a set of optical reticles ten times the size of the actual chip, one reticle per layer.

It's at this point in the manufacturing process that the reduction to the infinitesimal begins. Through a photoreductive process known as step-and-repeat, the reticles are used to create photomasks, glass plates that are employed in the factory to make the chips. The first set of photomasks are the master plates, from which the masks used in the plant are made; there's a photomask for each layer, and each mask may contain as many as five hundred IC images. Increasingly, however, the reticles and master masks are dispensed with, and the tape is fed into an electron-beam mask-making machine that, controlled by a computer, fashions the working plates. . . . A few companies, particularly IBM, are experimenting with fully automated chip-making machines.

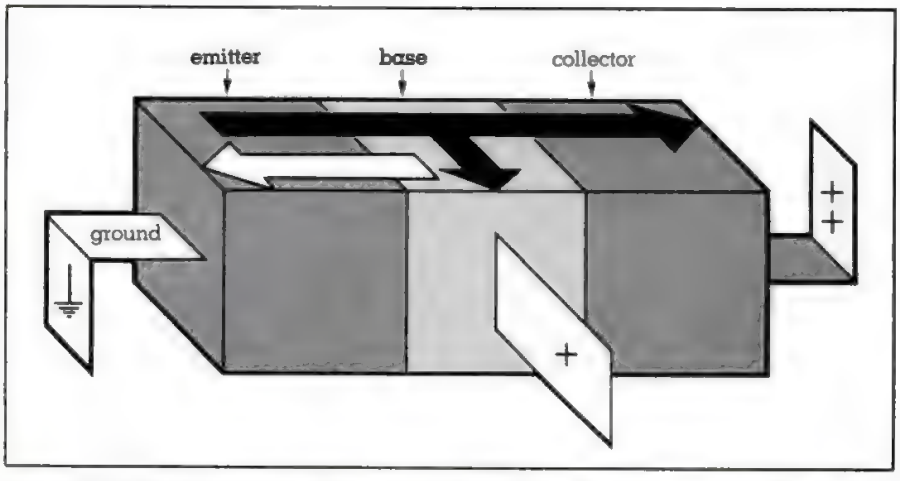


Figure 1: *Junction Transistor. A junction transistor is made up of layers of silicon that have been impregnated with extra electrons and positive ions. The drawing shows an npn transistor: a slice of positively doped silicon, the base, between two layers of negatively doped silicon, the emitter and the collector. When a positive voltage is applied to the terminals, electrons rush from the emitter to the collector, while holes travel toward the ground. It is the voltage applied to the base that both controls and amplifies the current leaving the collector.*

How Chips Store and Process Data

To sum up the discussion so far: ICs are composed chiefly of transistors that switch on or off in accordance with a sort of Morse code that follows the dictates of Boolean logic. That, in a nutshell, is how computers and other digital devices operate. But how do such machines *really* work? How do they actually remember things and perform calculations?

Let's begin with remembering. There are many forms of IC memories, but the two most widely used are random-access memory (RAM) and read-only memory (ROM). A RAM is like a scratch pad and is used to preserve the data and programs that a computer or other electronic device needs for its immediate operation. In a personal computer, for example, a RAM

is that part of the machine's memory available to the operator for storing numbers or documents or programs.

A ROM, on the other hand, is like a slate of chiseled marble and stores information and instructions necessary for the machine's general operation. The program that tells a handheld calculator how to perform division is kept in a ROM, along with instructions for finding square roots and for carrying out other functions. A ROM cannot be altered by the user.

Regardless of their memory capacities, RAMs and ROMs are essentially simple devices. Both chips are composed chiefly of memory cells arranged in geometric grids like those found on graph paper—a layout that allows each cell to have its own coordinates, or address, and so to be accessed directly. In a RAM, a basic cell consists of a capacitor and a transistor; the capacitor stores the data (the presence of an electrical charge represents a one, its absence a zero), while the transistor, when turned on, releases that data to the processing chips of the host machine or enables new information to be written in.

In a ROM, the only components in the cell are either a ground, which stands for a zero (electricity dissipates in a ground), or an open circuit, which represents a one (in which case, the computer is in effect reading the very current it has dispatched to the ROM). For convenience, the memory capacity of ICs is measured in units of K, which normally stands for a thousand but in electronics signifies 2^{10} or 1,024. Hence, a 1K chip can store up to 1,024 bits of data, a 64K chip 65,536 bits.

The processing of the enormous number of charges stored in a computer's memory is performed by a special class of chips called microprocessors. A microprocessor is the central processor of a computer; it includes all the circuits that carry out the arithmetic and logic operations, reduced to a single IC. One of the most important and versatile inventions of recent times, the microprocessor makes data processing possible in even the smallest device. It is the microprocessor that has given rise to most of the sophisticated products of modern electronics: handheld calculators, home computers, video games, programmable videotape recorders, automatic bank tellers, industrial robots, and hundreds of other machines. . . .

Over the years the architecture of microprocessors has become somewhat standardized. Microprocessors usually contain five key components. First, an arithmetic and logic unit (ALU), made of transistors arranged in the form of Boolean logic gates, executes mathematic and logic functions. Second, a bank of RAM-like parts called registers, made out of modified memory cells, stores data needed temporarily by the ALU. Third, a control unit, consisting of transistors in Boolean arrays, decodes data and implements programs stored in memory. Fourth, a network of interconnections, a data bus, links the various parts of the chip to one another. And, finally, a clock times all operations.

> A ROM is like a slate of chiseled marble.

A microprocessor is not, in and of itself, a computer on a chip. It must be used in conjunction with other ICs, particularly RAMs, ROMs, and input/output chips. But there is a class of chips, called microcontrollers, or microcomputers, that are truly computers on a chip. These ICs, which have been made possible by the relentless advance of microelectronic technology, include their own RAM, ROM, and input/output elements. They don't need other chips to assist them, although they are often linked with others so as to augment their power. . . .

By shunting on and off signals through millions of Boolean logic gates and the compact memory grids of RAMs and ROMs, microprocessors, microcontrollers, and other ICs can add, subtract, average, compare, contrast, differentiate, and otherwise manipulate binary numbers—all at fantastic rates. A bit can be written or read into a typical 16K RAM in as little as two hundred billionths of a second and can be read out of the average 16K ROM in even less time. And one recently produced microprocessor, a 32-bit chip from Hewlett-Packard, . . . can multiply two 32-bit numbers in a mere 1.8 millionths of a second, making it roughly four thousand times faster than the 30-ton, 18,000-tube ENIAC, which took a snail-like five hundredths of a second to multiply two 10-digit decimal numbers.

Well, What's Next?

The speed and complexity of ICs are not unlimited, of course, but in the opinion of three scientists, I. E. Sutherland, Carver A. Mead, and T. E. Everhart, IC technology is still in its youth:

> *There is every reason to believe that the integrated circuit revolution has run only half its course; the change in complexity of four to five orders of magnitude that has taken place during the past fifteen years appears to be only the first half of a potentially eight-order-of-magnitude development. There seem to be no fundamental obstacles to 10^7-to-10^8-device integrated circuits Rand Corp. Report R-1956-ARPA [Nov. 1976]).*

ICs with ten to a hundred million components? ICs whose basic operating units are not transistors but entire microprocessors, built by the millions into chips smaller than a thumbtack? Incredible as it may seem, such devices are a distinct, and utterly glorious, possibility.

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*[**Editor's note:** The second excerpt from* State of the Art, *to appear in the next issue of* PC, *will carry the story of the chip from the appearance of the first microprocessor, the Intel 4004, to the 1977 development of the programmable logic chip. The first selection of photographs begins on the next page.]*

1947

The Birth of Modern Electronics: The Point-Contact Transistor

BELL LABS

One of the greatest inventions of the twentieth century, the transistor was an unexpected outgrowth of research on radar in the United States and Great Britain during World War II. While working on this new method of detecting flying objects, scientists began studying an unusual and then little-known class of solids called semiconductors. Materials like silicon and germanium, which occupy the same column in the periodic table of elements, seemed to have great potential as amplifiers and, therefore, as substitutes for vacuum tubes.

Even before the war was over, in the summer of 1945, Bell Labs inaugurated a research project on semiconductors. The scientific arm of the phone company, Bell Labs was, and still is, the largest industrial research organization in the world, with a unique combination of scientific talent, managerial expertise, and financial resources. Bell Labs has been responsible for many of the most important advances in electronics, including the jerry-built contraption shown [in the photograph above].

What the phone company wanted from the semiconductor program was a solid-state alternative to the vacuum tube, the fragile, expensive, and energy-hungry switch and amplifier then being used in the phone system. The project was placed under the direction of physicist William Shockley and succeeded in just two and a half years when he and colleagues Walter Brattain and John Bardeen, also physicists, created the point-contact transistor on 23 December 1947.

By the time this unassuming little gadget was introduced to the public in 1948, it had been improved substantially. In place of the conglomeration shown here, the device was encapsulated in a sleek metal cylinder about half an inch long, with three protruding wires that reached down to a pinhead-sized bit of germanium soldered inside the tube. The germanium (silicon transistors didn't appear until 1954) amplified the current conveyed to it by two wires, while a third was linked to a ground.

In other words, a low-powered signal, like that produced by a radio wave, went in one end, and a high-powered one went out the other. It was that simple, and that revolutionary.

The triangular wedge is made of plastic and is covered with gold foil slit in half at the wedge's tip. One side of the wedge serves as the emitter, the other as the collector. The irregular-shaped material directly under the wedge is germanium, which acts as the base. Gains in current of up to a hundredfold may be attained with this device. (A re-creation.) Actual size: the wedge is 1.25 inches to a side.

1958

The Microelectronic Revolution Begins: The First IC

TEXAS INSTRUMENTS

Before the invention of the IC, electronic equipment was composed of discrete components like transistors, which serve as both switches and amplifiers; resistors, which impede the flow of electrons; and capacitors, which store them. These components, often simply called discretes, were manufactured separately and were wired or soldered together onto masonite-like circuit boards. Discretes took up a lot of room and were expensive and cumbersome to assemble, so engineers began, in the mid-1950s, to search for a simpler approach.

One of the most interesting developments was a manufacturing method adopted by the United States Army. Known as the micromodule system, it called for piling tiny wafers of discretes on top of each other like dishes. Connecting wires ran up the sides of the stacks through holes in the wafers. Micromodules were not only somewhat easier to make than conventional electronic systems, they were also a good deal smaller: a six-component module was about the size of the sharpened cone of a pencil.

In the summer of 1958, a young engineer by the name of Jack S. Kilby went to work for Texas Instruments, which by then had earned a reputation for itself as an innovative manufacturer of transistors. Kilby was slated to work on TI's micromodule program, but the army's system seemed to him to be unnecessarily complicated. He wondered whether it would be possible, instead of stacking discretes on top of each other, to fabricate all the electronic components—transistors, resistors, and the like—out of the same piece of material. It occurred to him that a properly engineered slice of germanium might be made to act as a whole slew of components, much as a tapestry can be embroidered with any number of designs and colors.

Kilby's first prototype was a phase-shift oscillator, a simple circuit that converts direct current into alternating current. However, instead of being made out of discretes wired together on a circuit board, his device was fashioned out of a thin wafer of germanium attached with wax to four electrical contacts. The circuit incorporated, all within the same chunk of germanium, a transistor, a capacitor, and the equivalent of three resistors (the germanium functioned as its own so-called bulk resistor). Although the development of the IC soon followed a different course, Kilby's creation was the first bona fide IC.

The first IC was made out of a thin slice of germanium (the light blue rectangle) and contained a single bipolar transistor (under the large aluminum bar in the center). It had four input/output terminals (the small vertical aluminum bars), a ground (the large bar on the far right), and wires of gold. The assemblage was held together with wax. The photo's blue tinge was created by a light shown on the chip. Actual size: 0.040 × 0.062 inches.

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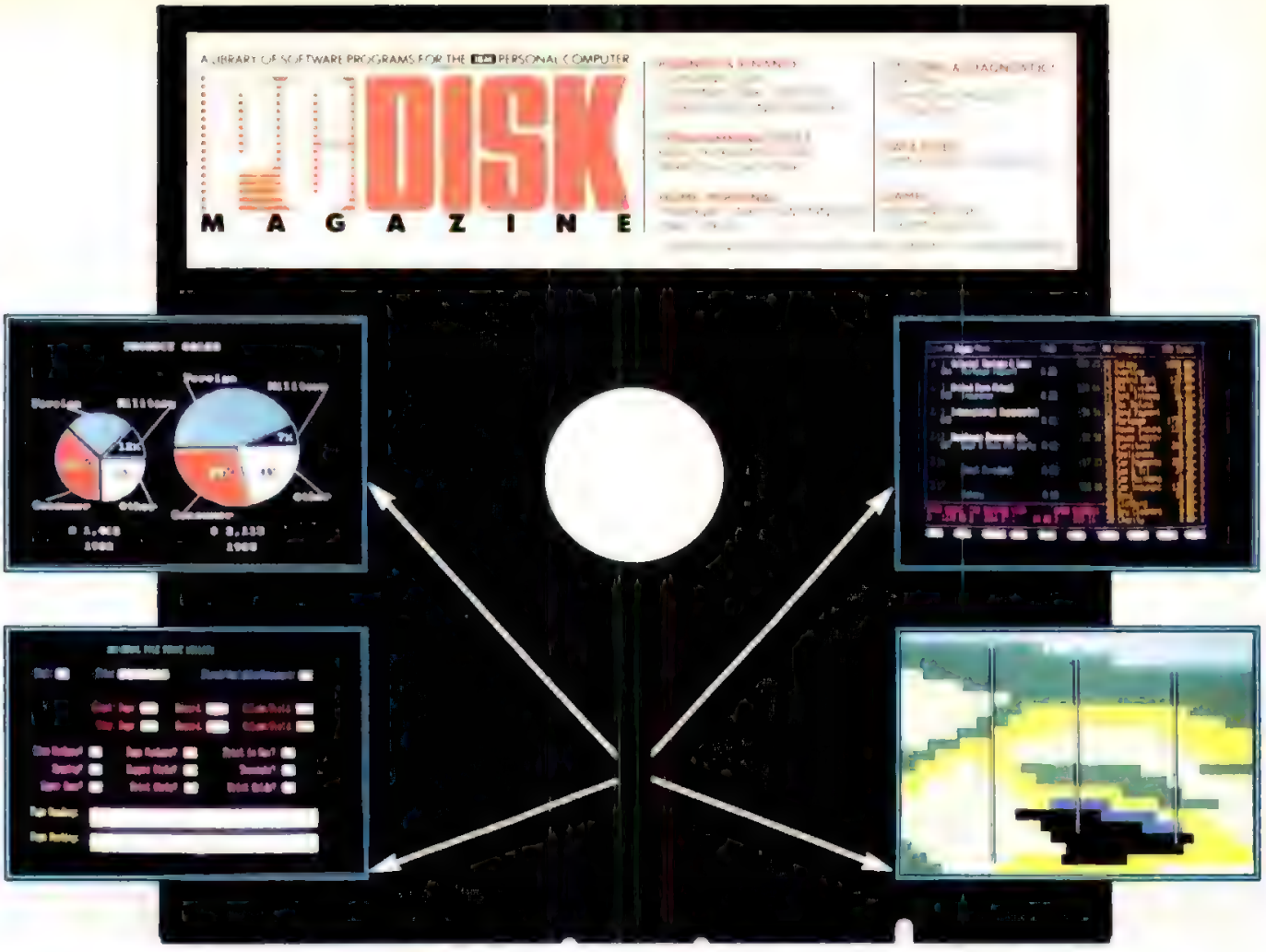

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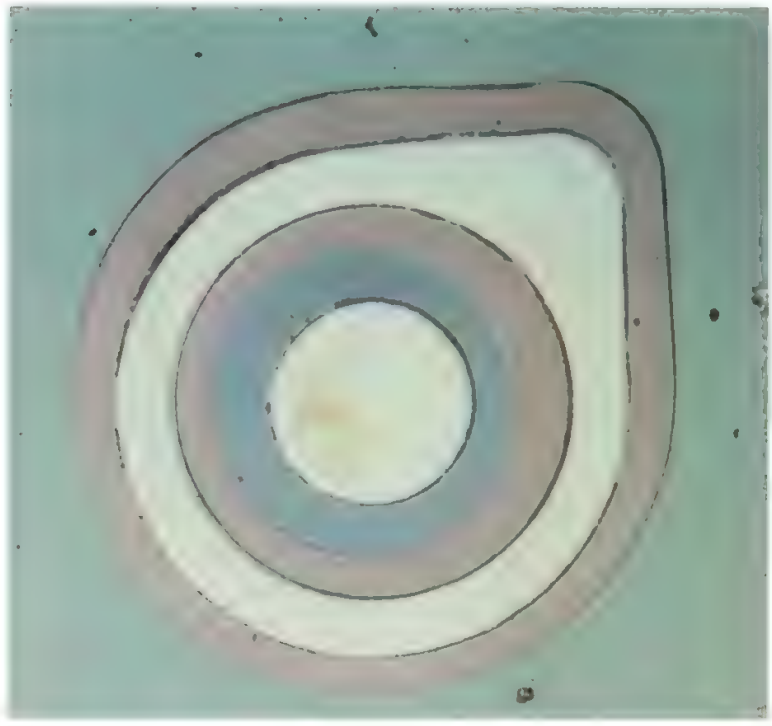


1959

The Most Efficient Way to Make Transistors: The Planar Process

FAIRCHILD CAMERA & INSTRUMENT CORP.

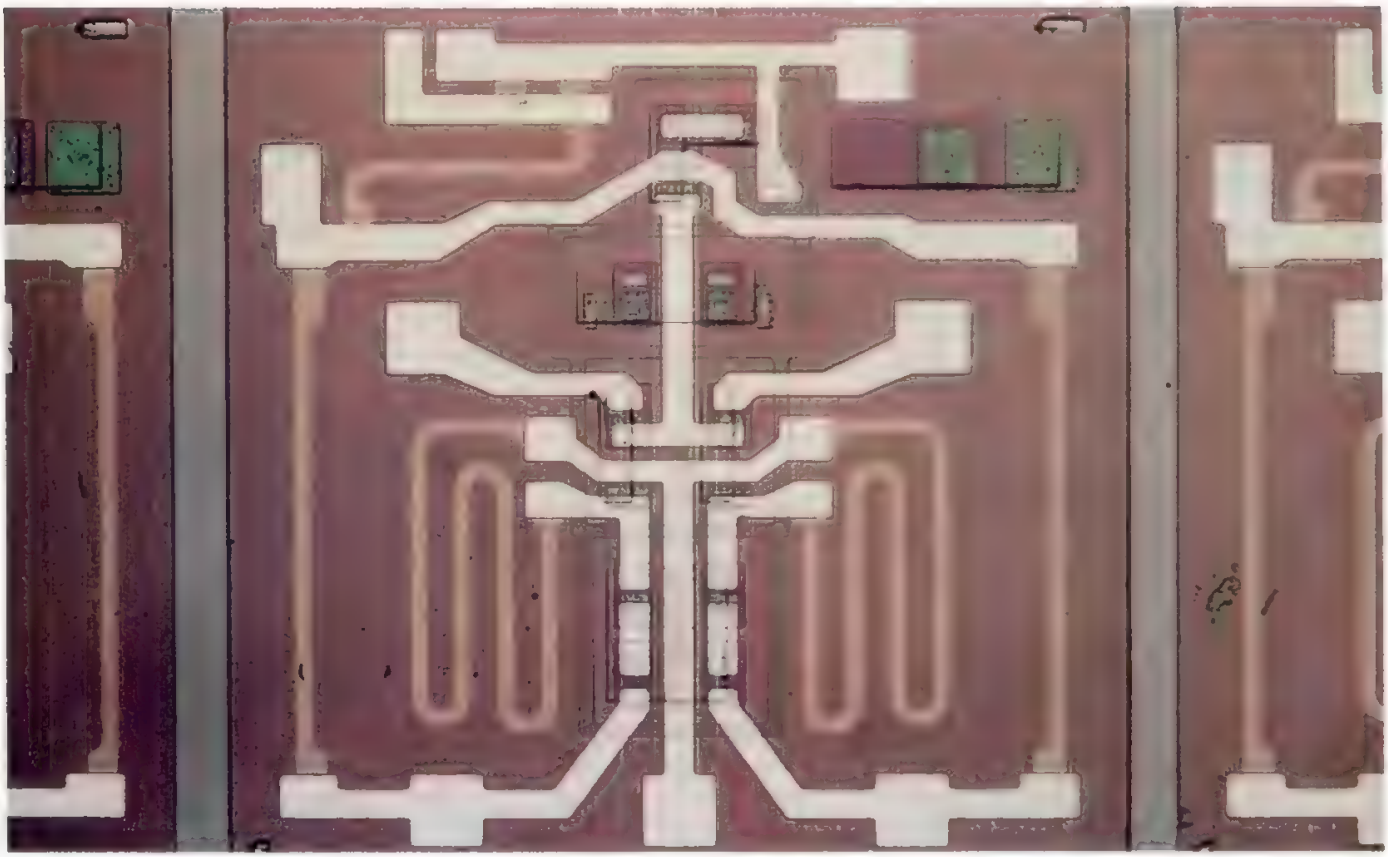
By the late 1950s, transistors had gone through several stages of development. For one thing, they were no longer fashioned out of germanium, but silicon, which offered certain distinct manufacturing and electrical advantages; for another, they were no longer made piece by piece, but in batches, through a simple photolithographic technique known as the mesa process. This process, which led directly to the creation of the commercially viable integrated circuit, is a form of contact printing.

A cross section of a typical mesa transistor resembles a windswept corner of the Grand Canyon: a plateau, or mesa, of silicon squatting on top of a foundation of silicon. The three essential parts of a transistor are all there: the base is the mesa, the collector is the foundation, and the emitter is a tiny piece of doped silicon embedded in the base. To fabricate a mesa transistor, a flat wafer of silicon was doped with either positive ions or electrons, covered with a photomask (a photographic plate), exposed to ultraviolet light, and then immersed in an acid bath, which etched away the exposed area around the mesa.

For all the manufacturing benefits brought about by the mesa process, it had two major drawbacks: the mesa was susceptible to both physical harm and contamination, and the process didn't lend itself to the making of resistors. Then Jean Hoerni, a Swiss physicist and one of Fairchild's founders, invented an ingenious way around these obstacles by creating a flat, or planar, transistor.

Instead of mounting the mesa, or base, on top of a foundation of silicon, he diffused it into the foundation, which served as the collector. Next he diffused the emitter into the base. (The base was composed of negatively doped silicon, the collector and emitter of positively doped silicon; the first planar device was thus a pnp transistor.) Then he covered the whole thing with a protective coating of silicon dioxide, an insulator, leaving certain areas in the base and the emitter uncovered. He diffused a thin layer of aluminum into these areas, thereby creating "wires" that hooked the device up to the outside (this was the idea of his colleague . . . Robert Noyce). The result was a durable and reliable transistor, and the all-important breakthrough that made commercial production of ICs possible.

The planar transistor can amplify current about thirty times. All of its components lie within a horizontal plane, protected by an insulating layer of silicon dioxide (invisible to the naked eye). The mauve region is the base, the inner green ring the emitter, and the surrounding green sea the collector. The central cream-colored plug and the teardrop-shaped ring are aluminum connectors (shown here without attached wires). Actual size: 0.06 inches in diameter.



1964

The First Linear IC: The μA702 Operational Amplifier

FAIRCHILD

One of the great divides in the IC's Lilliputian realm lies between digital and linear circuits. Digital chips can process only binary impulses, the on and off language of computers and most electronic machines, whereas linear ICs react only to analog, or continuous, input. To understand the difference, think of digital watches and ordinary timepieces: one tells the time by means of flashing numbers that grow by increments of one, and only one; the other does the job with continuously rotating hands.

The chip above is a highly versatile piece of microelectronics known as an operational amplifier, or op amp. It has hundreds of uses, although it's probably most frequently employed as a difference amplifier, a circuit that compares incoming signals and reports on their disparity. An op amp like the μA702 (the μ stand for micro, the *A* for amplifier) might be used, for instance, in a temperature-sensing device called a thermocouple, which consists of a closed circuit made up of two different metals, and which is found in most ovens. When the temperature changes, the voltage passing through the circuit climbs or falls, and the op amp senses and registers the shift.

An op amp can not only add or subtract incoming signals but can also average, integrate, and otherwise manipulate them. As a result, it's widely employed in control, measurement, and computational systems. It's even useful in certain digital equipment, as an intermediary of sorts between analog and digital machines. As the first op amp on a chip, the μA702, which was designed by Robert Widlar, was a significant milestone in IC history, and a commercial success for Fairchild.

The μA702 can amplify incoming signals up to seven thousand times. It has twelve bipolar transistors and five resistors. The transistors are the small greenish rectangular features on either side of the chip's central spine (the thick white bar with the square pad at the base); two transistors, lying on opposite sides of the upside-down T-shaped feature in the center, are unconnected. The resistors are the light brown loops and lines; the aluminum connectors are the thick white bars. The boxlike dark brown moats are the extruding portions of isolation channels. Actual size: 0.60 inches.

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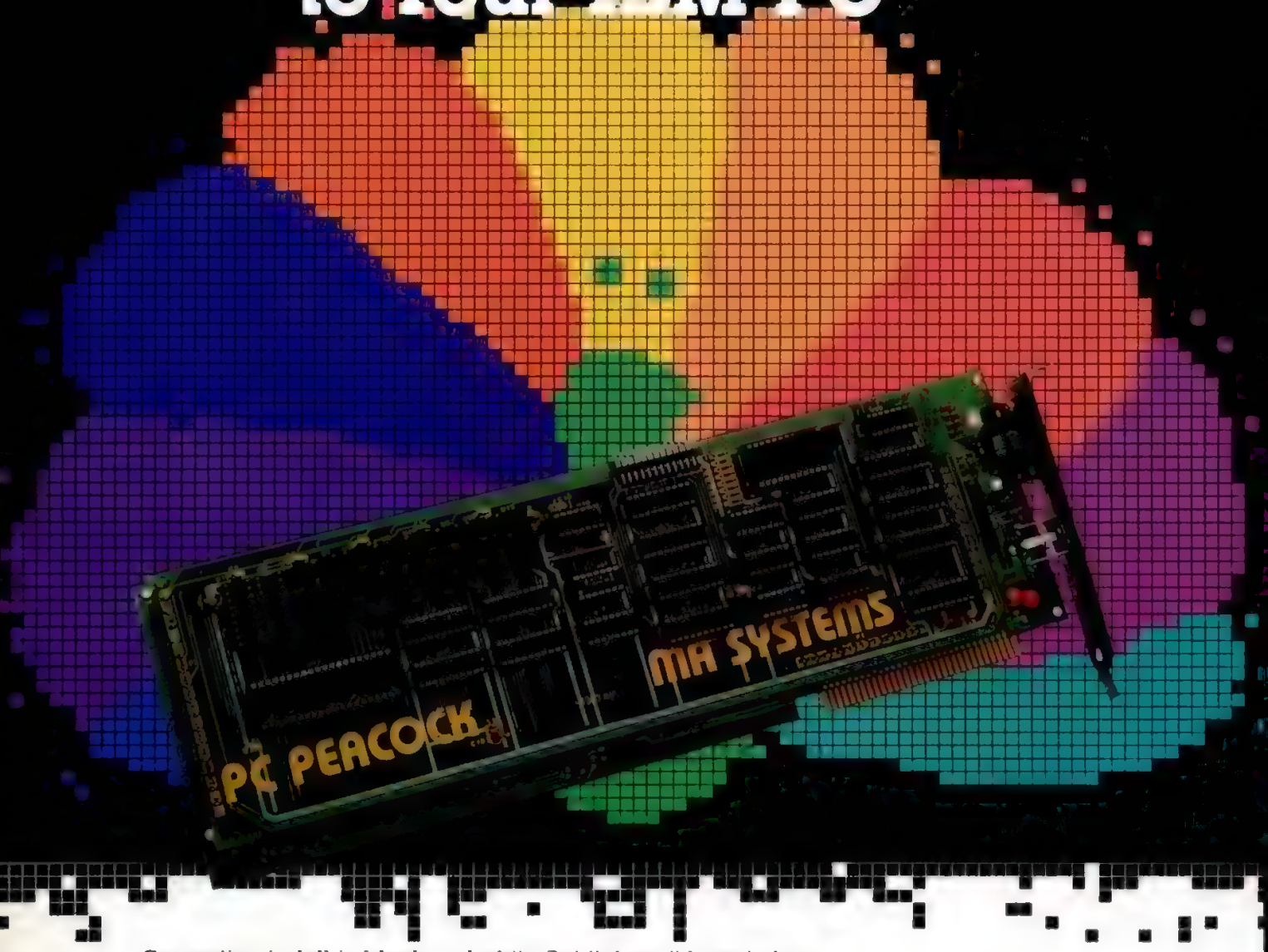

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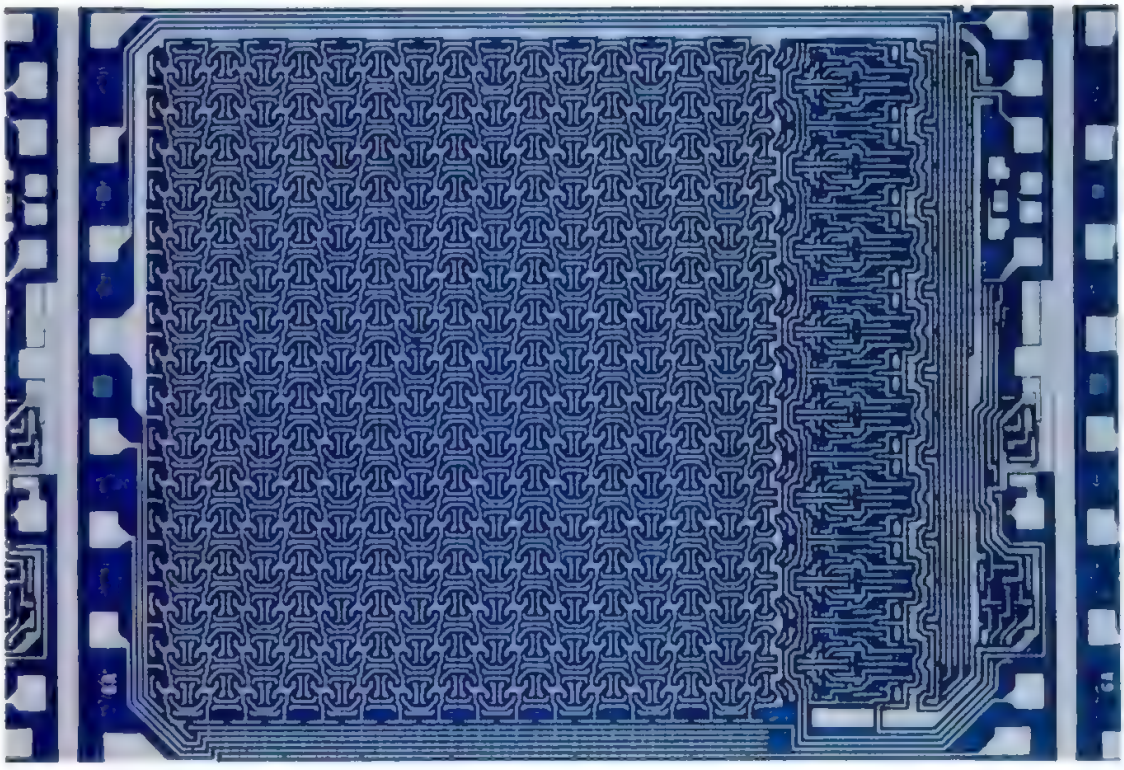


1970

The First 256-Bit Static RAM: The 4100

FAIRCHILD

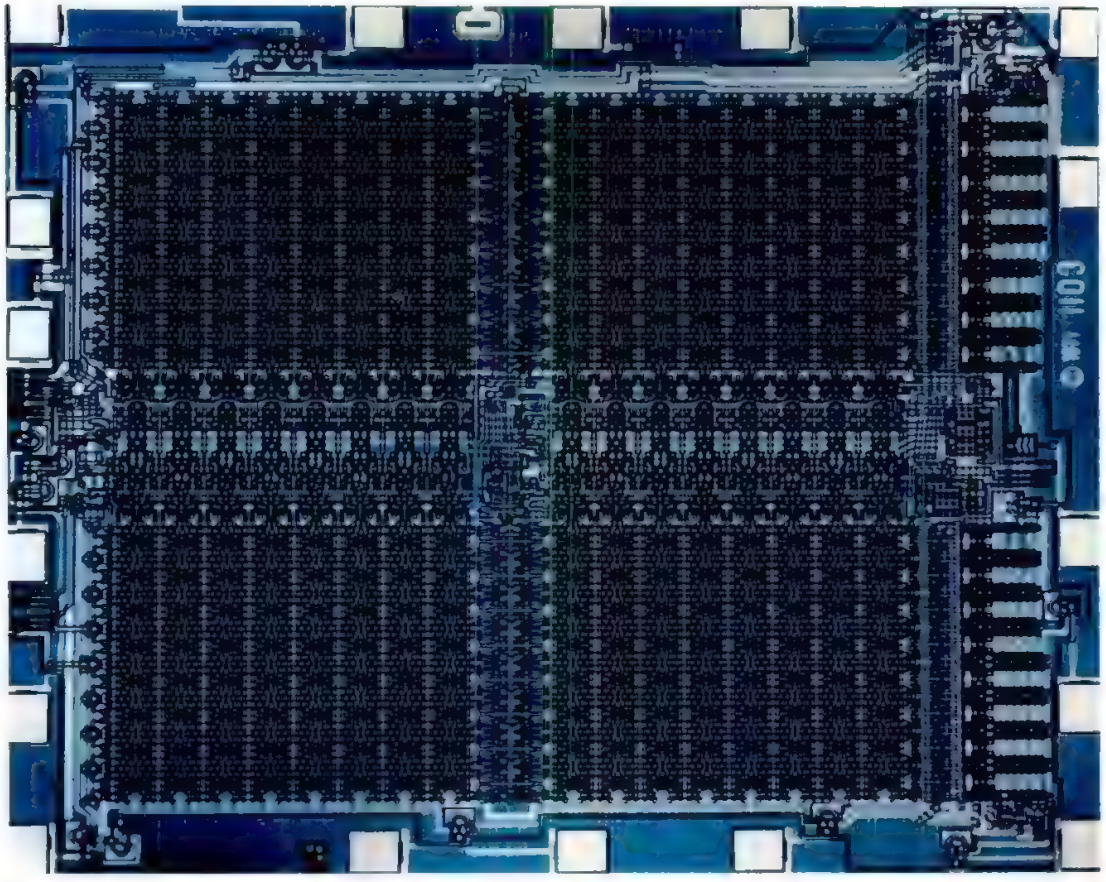
Computers store information in two places: internally, on memory chips like RAMs and ROMs, and externally, on magnetic discs and tapes. Just before the invention of semiconductor ICs, however, computers used a form of internal storage known as a magnetic-core memory. Cores were tiny rings of ferromagnetic material, each about a sixteenth of an inch in diameter, that were strung up on grids of fine wires suspended on small screens inside computers. Magnetized one way, a core represented a one; magnetized the other, it stood for a zero.

Cores were random-access devices, which meant that a single core could be accessed directly, without disturbing any of the other cores on the grid. Cores were rather fast—it took as little as a millionth of a second to read a bit stored in a core—and retained their contents even after the power had been turned off. But they were expensive, bulky, and destructive, in that the simple act of reading a core erased the data stored in it. It was therefore necessary to install circuits to restore the data as soon as it had been extracted.

Then, in 1970, Fairchild produced the first relatively capacious semiconductor memory, the 256-bit static RAM in the photo above. (The charges in static RAMs do not leak away, freeing such chips from the need for periodic refreshing; hence the term *static*.) Designed by H. T. Chua, this chip was able to retain, in the space of a single core, many times the amount of information. It was nondestructive and much faster and cheaper (although not at first). But, unlike a core, it lost its contents after the power was shut off, a condition known as volatility and one that is characteristic of most RAMs.

Primitive by today's standards, Fairchild's 256-bit RAM went into the ILLIAC IV computer, a powerful machine made for NASA by the Burroughs Corporation in the late 1960s, and one of the first mainframe computers to have an internal memory composed entirely of chips. With magnetic-core memories, the capacity and performance of computers were severely limited, but the arrival of memory ICs like the one above led to the creation of today's powerful, miniaturized computers.

Reading or writing a bit into any of the 4100's two hundred and fifty-six memory cells (the T-shaped features) requires only seventy billionths of a second. The circuits on the bottom are column decoders; those on the right are row decoders, amplifiers, and input/output elements. A signal sent simultaneously to both the row and the column decoders activates one cell only. Actual size: 0.104 × 0.134 inches.



1970

The First 1,024-Bit (1K) Dynamic RAM: The 1103

INTEL

In 1968, the physicists Robert Noyce, Gordon Moore, and Andrew Grove resigned from Fairchild and established their own semiconductor firm in Santa Clara, California. (Fairchild was in nearby Mountain View, also part of Silicon Valley.) Their departure was the first of many from Fairchild, as one entrepreneurially minded executive after another left to found his or her own outfit. Fairchild was a large and diversified corporation, whose managers, skeptical of the IC's future, gave its semiconductor operations short shrift, provoking a great deal of resentment among the subsidiary's top officials.

Intel (short for *int*egrated *el*ectronics) quickly developed a reputation as an innovative manufacturer of RAMs. The company, advancing the technology its founders had helped develop at Fairchild, produced a 64-bit static RAM (the 3101) and a 256-bit static RAM (the 1101) during its first two years in business. Then, in 1970, Intel leapfrogged over Fairchild and Texas Instruments with the first dynamic RAM, the 1K 1103. (Dynamic RAMs, unlike the static variety, require regular refreshing to bolster the charges in their memory cells. Static RAMs are more expensive, however, and are easier to use.)

The advent of the 1103, designed by Joel Karp and Bill Regitz, was a pivotal moment in the history of the IC. For the first time, it became possible to store a significant amount of information on a single chip—in this case, the equivalent of some twenty-five five-letter words. By contrast, the static RAM produced by Fairchild that same year held only 256 bits of data. The 1103 was not without its problems, though; it was slow, difficult to make, and touchy to operate. On the other hand, it proved the viability of semiconductor memories and greatly increased the power of computers. ■

It takes about 300 billionths of a second to read or write a bit into the 1103. This chip has 1,024 memory cells (the small rectangular features) arrayed in four grids of thirty-two columns and an equal number of rows. The circuits in the horizontal spine decode the columns; those along the vertical spine, the rows. Actual size: 0.113 × 0.139 inches.

PC Passion And Other Romances

The Cursor's Curse may be the next popular title for today's sci-fi and mystery writers—but so far their romance with the computer seems to be more of a blessing.

The fact that hundreds of technical and scientific writers are using word processors is no longer news. It is a fact of life that a microcomputer combined with the appropriate word processing software can make an author's life infinitely easier.

But what about the writers who produce the pulp romances, mysteries, and science fiction novels that you buy in your local drug store? How are such presumably nontechnical people adjusting to the era of word processing?

Not too badly, according to my survey of contemporary authors active in this field. And although they use a variety of equipment, many of them have found the IBM PC or one of its compatibles as ideally suited to their needs.

One of these is Bernhardt Hurwood, mystery writer and author of *My Savage Muse*, a fictional autobiography of Edgar Allan Poe. Hurwood, who somewhat resembles Poe himself, uses an Eagle IIE to write.

"I purchased the Eagle last summer after researching the market for about a year," said Hurwood. "I had come to the conclusion that *Spellbinder*, the word processing software that comes with the Eagle, was the easiest for me to write with. I didn't want to learn a lot about computers or programming, yet I wanted the capacity of and compatibility with the IBM PC. I might want PC software in the future.

"*Spellbinder* does almost everything *WordStar* does, and without my memorizing 145 commands. Each key on my Eagle IIE says File, Read, Format, Search, Erase, and so forth, in English, like a dedicated word processor, but I've got a full computer.

"I bought the cheapest letter-quality printer I could find at the time—the TTX (teletype printer). That was about $600. It's slow, but so what? After I edit, I use the *Spellbinder* mode that lets me scroll up my text and view it as it will come out on the printer. Often I just feed one page at a time into the printer—it's a minute and a half a page. I could use the tractor feed, but I like doing it this way. Now I understand the SCM (Smith-Corona) company

Illustration: Steven Lakeman

has come out with a good and faster printer for half what I paid. Still, I have no complaints about my printer."

I asked Bernhardt if Edgar Allan Poe would "shrink back in horror" if he were alive to see a writer using the Eagle IIE.

"No, absolutely not," he replied. "He would go for it. He would be the first to use a computer if he were here. He was absolutely fascinated with science and obsessed with scientific achievement. Don't forget that he wrote a hoax that ran as fact in the New York newspapers. He sold a tale of a transatlantic balloon trip as a true story. The editions that carried the fantastic story were selling out for 50 cents a copy—quite a price in the early 1800s.

"Based upon this episode and research I did into Poe's life, I can confidently say that given the opportunity, he would have been using a computer."

Computer Love Affair

Rosemary Guiley's romantic fiction has appeared in such magazines as *True Romances*, *True Confessions*, and *True Experience*. "In my opinion," she states, "a word processor is indispensable for anyone who is a professional writer of any kind. I became a full-time free-lancer 2 years ago, and one of the first things I did was get a system, because it enabled me to do better work faster."

Guiley, who is also the author of *Love Lines*, a guide to romance literature, feels there is absolutely nothing wrong in using high-tech equipment to produce girl-meets-boy fiction. In fact, she says, "I can't go back to a correcting Selectric; it's like a hammer and chisel. I really like having a screen where you can just wipe out something if you don't like it, and I really love being able to edit and polish right up until the final draft."

Guiley is also a professional journalist, and she already had some experience with video display terminals when she bought her word processor. However, she says that even her less up-to-date friends have no problem in orienting themselves to their new systems. Eventually. "I've heard from novelists who have had considerable difficulty in getting acclimatized. The first couple of days of learning a new software program are slow and frustrating—it seems they're never going to remember all the commands. But once they do, they wouldn't be without it."

It's almost a "death wish" for a screenwriter to still use a typewriter.

But while she's patient with those who are slowly venturing into the world of microprocessors, Guiley is less tolerant of writers who refuse to have anything to do with computers. "They equate literature and craft. A terminal is a tool, like a pencil or a typewriter, and anything that makes it easier for you to think and create and write is a boon to your profession." She smiles. "I get a little tired of writers who go on and on about how 'after all, they're *literary*.' Those are the people who won't be selling in the next 10 years."

A Dedicated Writer

Brian Garfield, writer of Hollywood screenplays such as *Death Wish* and *Hopscotch*, believes that most of the anticomputer remarks he's heard come from writers who have never seriously tried one. He uses what he calls an "antique," a Xerox 860 dedicated word processor but has been shopping around for a suitable replacement.

"I find it utterly indispensable to use the Xerox for screenplays," he told me. "It's over 5 years old, and it's a huge thing using 8-inch disks. There's a large floor console; the system takes up half a room—still, it suits my purposes. I use the Xerox solely for writing—it has a full-page screen, and the Xerox word processing has a blow-up feature, a zoom, that blows up half a page. Of course, nowadays you can get something adequate for a fifth of what I paid."

Garfield added that he considers it almost a "death wish" for a screenwriter to still use a typewriter. "I'd never retype 26 drafts on one project again without the screen to make the corrections."

Computer Sleuth

Hillary Waugh, writer of such popular mysteries as *The Missing Man* and *Last Seen Wearing*, uses his word processor to turn out what he calls "police procedurals"—stories that follow the police as they methodically go about solving a case.

His favorite character, Captain Fred C. Fellows, is an unexcitable sleuth who does all the routine police work that finally leads to an arrest. Waugh did a good deal of investigative work of his own before purchasing his Eagle IIE.

Waugh bought the Eagle because he felt it would save time. "I saw it demonstrated," he said, "at the Mystery Writers of America seminar at the John Jay College of Criminal Justice in New York. Eagle was one of many systems there. I tried the IBM PC, but it was more expensive, and I liked the dedicated keys setup on the Eagle.

"In early November 1983, I unpacked the system and plugged it in, but I couldn't get the Celica daisy-wheel printer to work. It wasn't set up for the Eagle. A friend of mine came over and fixed it up for me. It can type about 40 characters per second. The whole system cost under $3,000—a

price that includes the printer.

"I find the real advantage in using it is in my rewrites. For example, my biggest problem on *The Missing Man* was typing up the final form of the manuscript."

Waugh bought his micro shortly before marrying Shannon O'Cork, who is herself an acclaimed mystery writer. While Waugh uses his computer, she sits within 20 feet of him inside their winterized Connecticut shore cottage, where she types away on her IBM Selectric. Unimpressed with her husband's high-tech word processor, O'Cork said she'll stick with her typewriter for a while.

A PC Convert

Jan Stacy, science-fiction writer and writer on the cinema *(Doomsday Warrior* and *Rock and Pop in the Movies),* uses an IBM PC. He reported that he previously used a white-out-splattered Olivetti electric typewriter he bought for $120. "It was, for the price, a way to start out. But then I saw my brother's XT. He's a software writer and consultant for some major firms. I had never used anything but a clumsy Vydec word processor in an office years ago. I was amazed at the difference.

"I knew that I had to have multi-window capability for my film books. I have files upon files of trivia and other information on the cinema that I would love to bring up on the screen simultaneously with my manuscript. Sam showed me how the screens are all interactive and permit text to be transferred from one file to another. Incredible!"

Since Stacy's budget did not allow for an XT, he finally "settled" for an IBM PC. "The most scary thing about moving onto the PC was the possible loss of material. Writers have told me about losing pages of creative (and hard to recreate) text when the fuse blew or some other catastrophe occurred. I found the backup file function that allows you to recover text is worth the half of the disk it uses up. Sometimes I can never duplicate the way I say something the first time."

But word processing is not the only thing Stacy uses his PC for. "I like posting a question on the electronic bulletin board of CompuServe. I've gotten into long conversations. You'd be surprised by what obscure trivia I've gotten about the cinema just by posting a question.

(continued)

Hassles, Hurdles, and Hints

Writers currently using computers discuss problems that they have encountered and reveal their solutions.

Whitley Streiber, author of such horror film classics as *Wolfen* and *The Hunger*, had two irritating problems with his computer's monitor and printer. "I had a real problem with the standard green-on-black monochrome monitor. Staring at that screen dried up my tear-ducts. It was so unpleasant that I considered giving up and going back to a typewriter. But I had heard of the problem being solved by switching to an amber screen. I bought what is now called the USI 1200A (a 12-inch amber monitor), and now I'm fine. I'm glad, because it would be hard to do without all the editing features on the computer monitor.

"The second problem was the printer I bought. I had a Qume that literally ate printheads. There was a lot of down time, and I finally gave up on it and went to a dot matrix printer. That was fine—until an article in *Publishers Weekly* mentioned that I use it. Editors that formerly accepted the correspondence-quality hard copy started complaining that it bothered them.

"So I got an NEC Spinwriter letter-quality printer. That's fine too, but it gives me about 35 characters per second instead of the 110 I was getting on the dot matrix, so I simply leave it printing all evening.

Donald Porter is an Alabama-born millionaire who also writes pulp Westerns. He said that he had a problem that doesn't seem to bother many people. "I like to see back a full page without scrolling. So I purchased a big-screen Motorola monitor that has 56 lines in order to solve that sticky point.

"I also noticed the paper I was tractor-feeding into the Diablo printer had rough edges that made it seem like computer-generated copy. This was especially bad on letters, but I didn't like it on manuscripts either. I switched to UARCO microperforated paper. When you rip off the edges it looks just like ordinary typewriter paper."

Tiffany Holmes, who writes books on astrology and does a regular column for *Complete Woman* magazine, composes her prose using *Perfectwriter* and *WordPlus*. She appreciates the ease of word processing but does have some problems adjusting her software for footnotes. "The capacity for footnotes at the bottom of the page is limited," Holmes stated. "That changed my tendency for copious footnotes until I started putting them in the back of the book rather than on the page. Simple enough—except sometimes I *want* those footnotes down there!"

However, even with the footnote foul-up, she enjoys being creative with her computer. "For inspiration I have a file that peps me up with a silly poem by Ogden Nash, or psychs me up with an inspirational quote about Dashiell Hammett's rejections. I call it PEP.

"I also have a little demo program that I show to all my writer friends that drop by. It's about Scotland Yard Inspector Reginald grilling some suspects. I let my friends edit it so they can see the capabilities they don't have on their typewriters."—R.S.

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PC PASSION

"Once I got a reply directly from a long-retired actor about the films he was in. Can you beat that? His nephew had the computer, saw my question posted, and

When a story is not going so well, I boot up Zuran and blast those Eclon ships for a while.

voilà! This actor gave me some interesting information I bet no one else had."

Stacy likes the games too. "I feel it's important to remain loose when writing. When a story is not going so well, I boot up *Zuran* and blast those Eclon ships for a while. It helps, believe me."

He's also interested in connecting his PC to another in a local-area network. "I often work with cowriters. I haven't done it yet, but I like the possibility of connecting to another writer's PC and working together this way instead of meeting and integrating each other's work in the cumbersome old way. Dedicated word processors have very limited abilities along these lines—another reason I got the PC."

Learning New Tricks

Gloria Amoury, former executive secretary of the Mystery Writers of America says, "Some writers would sooner give up their aged mothers than their rusty old manual typewriters. It's not a rational thing you can argue with. They feel that there is some mystical connection between the beat-up Royal and themselves that must not be broken."

A case in point is Thomas Chastain, writer of the best-selling novel *Who Killed the Robins Family?*, who admits to using a pad and a number-1 pencil. But Chastain may still become a word processing writer one day. After all, he allowed, "Old dogs will have to learn new tricks." ■

Analyzing Property Investments

The Real Estate Investment Package can help you decide whether to get in on that property deal, buy a condo, or rent out that apartment in your basement.

Are you looking for an easy way to use your spreadsheet for analyzing small-scale real estate investments? If so, Tom Ciulik's *Real Estate Investment Package* may be useful to you in deciding whether to rent, buy, hold, or sell a property, and in calculating depreciation, amortization, and income.

The package, to which the author has given the cheerful acronym *RIP*, contains 13 templates that work with *VisiCalc*, or if you translate them, with Lotus's *1-2-3*. (Translation instructions are included.) A spreadsheet template is a set of column labels, values, and equations that plug into the spreadsheet to make it perform a particular set of calculations, saving you the trouble of programming it yourself in the spreadsheet's language. Two of *RIP*'s templates are more complex than the others and are the real workhorses—the chief reasons, in fact, for buying the package. They help you compare different commercial real estate investments or determine the relative advantages of buying or renting a home. One of the other 11 templates keeps track of income and expenses on rental property and the rest calculate different depreciation and amortization schedules.

Although easy to use, the package will be most helpful to those familiar with the ins and outs of real estate finance and tax law. In addition, facility with the spreadsheet will allow you to modify the templates to get around the package's few minor quirks. Otherwise, you need not understand spreadsheets. The *RIP* manual is written as if the user knew next to nothing about spreadsheets and clearly explains how to load the templates, enter values, and print the results.

Real Estate Investment Package
Tom Ciulik
3011 Bunker Hill Circle
Marietta, GA 30062
Price: $29.95
Requires: 64K RAM with DOS 1.1 or DOS 2.0. Printer with compressible type or 130 column carriage. *VisiCalc*, or after translation, Lotus's *1-2-3*.

CIRCLE 681 ON READER SERVICE CARD

RIPINANL.VC-Real Estate Investment Analysis---Copyright 1983, Tom Ciulik

Purchase Price of Property========)	100000.00	Any Property			
********** Principal==========)	85000.00	Description here			
1st Mortgage Number of years======)	25	1st-Total Payments	300		
********** Interest Rate========)	14	Per Month	.0116666667		
**********		Monthly Payment	1023.20		
********** Principal==========)	0.00				
2nd Mortgage Number of Years======)	0	2nd-Total Payments	0		
********** Interest Rate========)	1	Per Month	8.333333E-4		
(must be at least 1)		Monthly Payment	0.00		
Annual Inflation Rate============)	5				
Incremental Tax Rate (State + Fed)=)	38				
Annual Straight Line Depreciation==)	0.00				
Sales Commission at time of Sale===)	7				
Down Payment====================)	15000.00				

	Financial Analysis For	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8
1	Total Monthly Payment	1023.20	1023.20	1023.20	1023.20	1023.20	1023.20	1023.20	1023.20
2	Total Annual Payment	12278.36	12278.36	12278.36	12278.36	12278.36	12278.36	12278.36	12278.36
3	1st Mortgage Annual Interest	11874.75	11814.48	11745.20	11665.57	11574.06	11468.88	11347.99	11209.04
4	2nd Mortgage Annual Interest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Total Annual Interest	11874.75	11814.48	11745.20	11665.57	11574.06	11468.88	11347.99	11209.04
6	Value of Building	85000.00	85000.00	85000.00	85000.00	85000.00	85000.00	85000.00	85000.00
7	ACRS Depreciation Rate	0.12	0.10	0.09	0.08	0.07	0.06	0.06	0.06
8	Annual Building Depreciation	10200.00	8500.00	7650.00	6800.00	5950.00	5100.00	5100.00	5100.00
9	Annual Straight Line Depreciation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	Total Annual Depreciation	10200.00	8500.00	7650.00	6800.00	5950.00	5100.00	5100.00	5100.00
11	Annual Taxes	2000.00	2100.00	2205.00	2315.25	2431.01	2552.56	2680.19	2814.20
12	Annual Insurance	500.00	525.00	551.25	578.81	607.75	638.14	670.05	703.55
13	Annual Maintenance & Misc.	500.00	525.00	551.25	578.81	607.75	638.14	670.05	703.55
14	Misc 1st Year Expenses	1000.00							
15	Total Annual Expenses	4000.00	3150.00	3307.50	3472.88	3646.52	3828.84	4020.29	4221.30
16	Monthly Rental Income	875.00	918.75	964.69	1012.92	1063.57	1116.75	1172.58	1231.21
17	Annual Rental Income	9975.00	10473.75	10997.44	11547.31	12124.67	12730.91	13367.45	14035.83
18	Total Annual Int + Depr + Exp	26074.75	23464.48	22702.70	21938.45	21170.58	20397.72	20468.27	20530.34
19	Taxable Income Write Off	16099.75	12990.73	11705.26	10391.14	9045.90	7666.81	7100.82	6494.52
20	Income Tax Savings	6117.91	4936.48	4448.00	3948.63	3437.44	2913.39	2698.31	2467.92
21	Annual Cash Flow	-6303.36	-4954.61	-4588.43	-4203.93	-3800.21	-3376.30	-2931.20	-2463.84
22	Money in Pocket	-185.46	-18.14	-140.43	-255.29	-362.76	-462.91	-232.88	6.08
23	Payment to Principal	403.61	463.89	533.16	612.79	704.30	809.48	930.37	1069.32
24	$ Return On Investment	218.15	445.75	392.74	357.49	341.54	346.58	697.49	1073.40
25	% Return On Investment	1.45	2.97	2.62	2.38	2.28	2.31	4.65	7.16
26	Property Value at End of Year	105000.00	110250.00	115762.50	121550.63	127628.16	134009.56	140710.04	147745.54
27	Loan Balance at End of Year	84596.39	84132.50	83599.34	82986.55	82282.25	81472.76	80542.39	79473.07
28	Equity at End of Year	20403.61	26117.50	32163.16	38564.07	45345.91	52536.80	60167.65	68272.47
29	Book Value at End of Year	89800.00	81300.00	73650.00	66850.00	60900.00	55800.00	50700.00	45600.00
30	Net Sale Amount	97650.00	102532.50	107659.13	113042.08	118694.19	124628.89	130860.34	137403.36
31	Capital Gain	7850.00	21232.50	34009.13	46192.08	57794.19	68828.89	80160.34	91803.36
32	Tax on Gain	1193.20	3227.34	5169.39	7021.20	8784.72	10461.99	12184.37	13954.11
33	Cash in Pocket After Sale	11860.41	15172.66	18890.40	23034.33	27627.22	32694.14	38153.58	43976.18
34	$ Return on Down Payment	-3139.59	172.66	3890.40	8034.33	12627.22	17694.14	23153.58	28976.18
35	% Return on Down Payment	-20.93	1.15	25.94	53.56	84.18	117.96	154.22	193.17
36	% Per Year	-20.93	0.58	8.65	13.39	16.84	19.66	22.03	24.15
37	Total $ Return on Investment	-3325.05	-30.94	3546.38	7435.02	11665.14	16269.15	21475.71	27322.39
38	Total % Return on Investment	-22.17	-0.21	23.64	49.57	77.77	108.46	143.17	182.15
39	Total % Per Year	-22.17	-0.10	7.88	12.39	15.55	18.08	20.45	22.77

Figure 1: *A typical printout of a RIPINANAL analysis with line numbers inserted.*

Investment Analysis

The most complex and useful template is stored in a 10,600-byte file called RIPINANL, which stands for *RIP* Investment Analysis. Using key values and assumptions for a potential real estate investment, it does a fairly sophisticated 8-year analysis of two kinds of returns: gains or losses from sale of the property and tax consequences of holding the property as a continuing investment. You can thus use the template either to compare returns for different properties or to weigh the advantages of either operating or selling the same piece of property.

Figure 1 is a typical printout of a RIPINANL analysis. Even printed in the compressed mode, it just fits on a standard piece of printer paper. The top part of the printout shows the values that you enter: purchase price; amount of loan; interest, tax, and inflation rates; and an estimate of the sales commission you'll pay when you resell the property. The template also allows you to include a second mortgage and offers the choice of straight-line or Accelerated Cost Recovery System (ACRS) depreciation, which enables you to take the tax losses from the property sooner.

Lines 1 through 25 (numbers along the right margin have been added in this figure for clarity) give the results of operating the building, while lines 26 through 39 are consequences of a sale. The results in each cell are mostly self-explanatory, but the manual includes a line-by-line explanation of what goes into each calculation.

Many items are set for a default value, but you can easily override them by inserting a value yourself. For example, the value of the building in line 6 is set at 85 percent of the entire property's price (which you insert) on the assumption that the land accounts for 15 percent of the cost. This difference in values is important because land cannot be depreciated, so only the building value is used for the depreciation calculation. Of course, if you know the precise value of the building you can enter it. The items in lines 11 through 17—taxes, insurance, rental incomes—also default to percentages of the purchase price, which you can also override.

Line 22, money in pocket, is your bottom line for operating the building. It represents your income tax savings from owning the property (line 20) minus the money you spend (line 21) paying for and running the building. In the sample case, the money-in-pocket figure is negative for the first 7 years; this building is not a profitable investment of the down payment.

Nevertheless, in line 24 we find that the *RIP* model does report a small profit, because it considers repayment of principal on the loan (that is, the increase in your equity) a kind of return on the initial investment. Since, in each year, this amount (line 23) outweighs the negative money-in-pocket figure (line 22), the template concludes that the investment is marginally profitable (line 25). This piece of accounting is rather unorthodox. Repayment of principal is not normally treated as return on investment, since it has nothing to do with profitability, although it does represent an increase in assets. If you are familiar with spreadsheets, it's not hard to rework the template so that it does not include repayment of principal as return on investment. You can also simply subtract the figure from the final result by hand.

> In the sample case, the building is not a profitable investment of the down payment.

Lines 26 through 39 analyze the consequences of a sale. The program assumes that property value (line 26) rises with the rate of inflation, but you can set it to any value that seems realistic. *RIP* calculates capital gain (line 31) as the difference between your net sale proceeds (line 30) and book value (line 29), and assumes that your gain is taxed at 40 percent times the marginal tax rate.

Additional Depreciation

Unfortunately, in the real world, calculating capital gains on real estate is not so simple. Since book value of property decreases with the rate of depreciation, the IRS is not willing to let you both benefit from the rapid write-offs possible under the ACRS depreciation method and then claim the entire difference between the property's now lower book value and what you actually got for it as a capital gain, which is taxed at lower rate than ordinary income. You have to calculate the difference between the depreciation you actually claimed under ACRS and the lesser amount of depreciation to which you would have been entitled under the straight-line method. This difference is called "additional depreciation," and that component of the difference between the book value and your net sales proceeds is taxed as ordinary income rather than as a capital gain. Since the *RIP* template treats the whole thing as a capital gain, it overstates the tax benefits of selling. The author of the program calls this defect "a known bug" and is preparing a new version of the template that calculates both ACRS and straight-line depreciation and uses the difference to arrive at more accurate capital gains and tax figures in lines 31 and 32. Future purchasers are likely to get the updated version.

One might also quibble with how *RIP* figures the annual rate of return on a sale (line 39). As currently programmed, the rate of return is nothing more than the total rate of return (line 38) divided by the number of years that have elapsed since the purchase. The annual rate of return should really be the equivalent *compound* interest rate; however, the difference only amounts to a few percentage points in the later years. If you are capable of some really inspired tinkering, you can make the spreadsheet find the correct value; if not, don't worry about it.

Despite these defects, RIPINANL

RIPLVPUR.VC-Lease VS Purchase Analysis--------Copyright 1983, Tom Ciulik**********

1st Year Monthly Lease Payment=====>	875.00			
Purchase Price of Property=========>	100000.00	Any Property		
********** Principal==========>	85000.00	Description here		
1st Mortgage Number of years======>	25	1st-Total Payments		300
********** Interest Rate=========>	14	Per Month		.0116666667
**********		Monthly Payment		1023.20
********** Principal==========>	0.00			
2nd Mortgage Number of Years======>	0	2nd-Total Payments		0
********** Interest Rate=========>	1	Per Month		8.333333E-4
(must be at least 1)		Monthly Payment		0.00
Annual Inflation Rate=============>	5			
Incremental Tax Rate (State + Fed)=>	38			
Sales Commission at time of Sale===>	7			
Down Payment======================>	15000.00			

Financial Analysis For	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8
Total Monthly Payment	1023.20	1023.20	1023.20	1023.20	1023.20	1023.20	1023.20	1023.20
Total Annual Payment	12278.36	12278.36	12278.36	12278.36	12278.36	12278.36	12278.36	12278.36
1st Mortgage Annual Interest	11874.75	11814.48	11745.20	11665.57	11574.06	11468.88	11347.99	11209.04
2nd Mortgage Annual Interest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Annual Interest	11874.75	11814.48	11745.20	11665.57	11574.06	11468.88	11347.99	11209.04
Annual Taxes	2000.00	2100.00	2205.00	2315.25	2431.01	2552.56	2680.19	2814.20
Annual Homeowners Insurance	500.00	525.00	551.25	578.81	607.75	638.14	670.05	703.55
Annual Maintenance & Misc.	500.00	525.00	551.25	578.81	607.75	638.14	670.05	703.55
Misc 1st Year Expenses	1000.00							
Total Annual Expenses	4000.00	3150.00	3307.50	3472.88	3646.52	3828.84	4020.29	4221.30
Total Annual Int + Exp	15874.75	14964.48	15052.70	15138.45	15220.58	15297.72	15368.27	15430.34
Taxable Income Write Off	14874.75	13914.48	13950.20	13980.82	14005.07	14021.44	14028.18	14023.24
Income Tax Savings	5652.41	5287.50	5301.08	5312.71	5321.93	5328.15	5330.71	5328.83
Net Annual Cost Of Purchase	10222.35	9676.98	9751.62	9825.74	9898.65	9969.57	10037.57	10101.51
Payment to Principal	403.61	463.89	533.16	612.79	704.30	809.48	930.37	1069.32
Property Value at End of Year	105000.00	110250.00	115762.50	121550.63	127628.16	134009.56	140710.04	147745.54
Loan Balance at End of Year	84596.39	84132.50	83599.34	82986.55	82287.25	81472.76	80542.39	79473.07
Equity at End of Year	20403.61	26117.50	32163.16	38564.07	45345.91	52536.80	60167.65	68272.47
Net Sale Amount	97650.00	102532.50	107659.13	113042.08	118694.19	124628.89	130860.34	137403.36
Capital Gain	-2350.00	2532.50	7659.13	13042.08	18694.19	24628.89	30860.34	37403.36
Tax on Gain	-357.20	384.94	1164.19	1982.40	2841.52	3743.59	4690.77	5685.31
Cash in Pocket After Sale	13410.81	18015.06	22895.60	28073.13	33570.42	39412.54	45627.18	52244.98
$ Return on Down Payment	-1589.19	3015.06	7895.60	13073.13	18570.42	24412.54	30627.18	37244.98
% Return on Down Payment	-10.59	20.10	52.64	87.15	123.80	162.75	204.18	248.30
% Per Year	-10.59	10.05	17.55	21.79	24.76	27.13	29.17	31.04
Monthly Lease Payment	875.00	918.75	964.69	1012.92	1063.57	1116.75	1172.58	1231.21
Annual Lease Payment	10500.00	11025.00	11576.25	12155.06	12762.82	13400.96	14071.00	14774.55
Annual Renters Insurance	250.00	262.50	275.63	289.41	303.88	319.07	335.02	351.78
Gross Cost of Renting	527.65	1610.52	2100.25	2618.73	3168.04	3750.45	4368.46	5024.82
Compound Interest on Down Payment	750.00	1537.50	2364.38	3232.59	4144.22	5101.43	6106.51	7161.83
Cash in Pocket After Leasing	15222.35	14399.32	13125.94	11375.43	9119.02	6325.78	2962.39	-1007.10
Net Cost of Leasing	-1811.54	3615.73	9769.65	16697.70	24451.40	33086.76	42664.79	53252.08
Per Year	-1811.54	1807.87	3256.55	4174.43	4890.28	5514.46	6094.97	6656.51
Per Month	-150.96	150.66	271.38	347.87	407.52	459.54	507.91	554.71

Figure 2: *A printout of the RIPLVPUR template using the same variables as in Figure 1.*

gives you a good overview of the results you can expect if you buy income-producing property. In the case analyzed here, holding and operating the property becomes profitable in the eighth year, and then, just barely so (see line 22). Selling it, on the other hand, would be profitable beginning with the third year, and increasingly so the longer you wait before selling—if our assumptions are accurate.

The other workhorse in the *RIP* template collection compares the benefits of buying a home—and later selling it—with renting. Figure 2 is a printout from the RIPLVPUR (lease vs. purchase) template with all the same variables as in the previous example. The results are not the same as in Figure 1 because, as a homeowner, you would not be allowed to depreciate the property or to subtract operating and maintenance expenses from your taxable income. Nevertheless, the *RIP* model still shows that it is always more profitable to buy a house, hold it for a period and then sell, except during the first year, when the net cost of renting is negative. The longer you hold a house, the greater your profit on a sale.

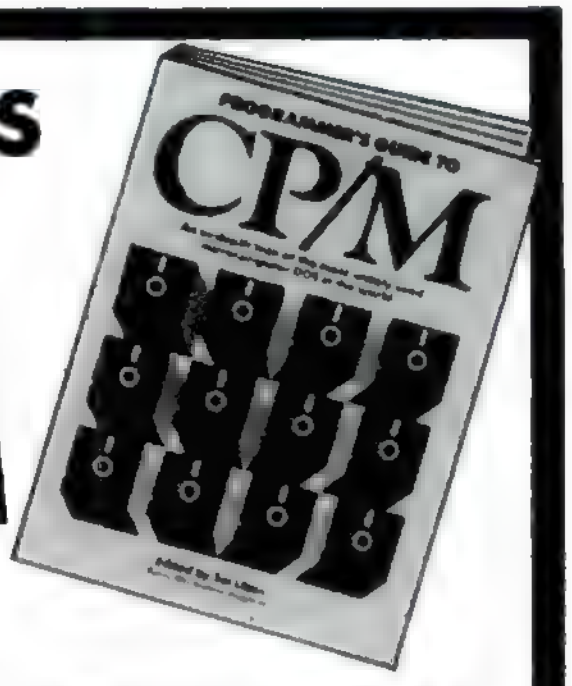
The rest of the *RIP* templates are much simpler. Eight of them are straightforward depreciation programs for eight different methods. They prompt for such variables as purchase price and depreciation period and will then calculate annual depreciation values for a maximum of 50 years.

A separate amortization program calculates monthly payments of principal and interest for mortgages of any amount, duration, or interest rate.

Finally, the *RIP* package contains what the author calls a Real Estate Rental Worksheet. You can use this template to enter all expenses and income associated with a specific piece of rental property. At the end of the year, it will total everything and calculate your net income or loss. The template allows you to insert as many new rows as you need to include all your expense and income items.

All in all, the *RIP* templates are well designed and perform as expected. Experienced spreadsheet users could certainly design similar templates themselves, but the time spent coding RIPINANL alone is probably worth the $29.95 the author charges for the package. Once the investment analysis template has been corrected to handle additional depreciation, the package will be a useful tool. ■

PROGRAMMER'S GUIDE TO CP/M



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Sizing Up The Professional

More than just a worthy machine in its own right, the Texas Instruments Professional Computer points out what's right and wrong with our favorite from IBM.

Photograph: Greg Schlight

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It looks like a PC clone. It acts like a PC clone. It even smells like a PC clone. But slide your favorite IBM PC program into its disk drive slot, and when the system internally hemorrhages, you'll know that the Texas Instruments Professional Computer is no ordinary clone.

As IBM PC clones go, the TI Professional Computer is among the least compatible computers that can be imagined. Anything more IBM machine-specific than a BASIC program will probably crash it. Yet, strange as it may seem, incompatibility carries good news for IBM owners and for some applications even makes the TI a more desirable machine than an IBM.

What heresy! What blasphemy! What am I talking about?

On the surface and just below, the TI-PC shares a multiplicity of features with the IBM. They have roughly the same mechanical layout, the same approach to design—expandable and bus-oriented (plug-in-the-cards)—and even have the same microprocessor. Yet no one would consciously design a computer so incompatible with the IBM PC and yet so similar to it unless there were good reasons for that similarity. Those good reasons confirm the soundness of the IBM PC's fundamental design—which all too many critics and competitors have maligned. That is good news.

The incompatibilities mean that the engineers at TI must have tried hard to make their machine better than the IBM PC by eliminating its shortcomings while preserving all the best features. The result is a solid, well-designed, and well-built machine that should be near the top of the list for applications where PC compatibility is not important.

The engineers at Texas Instruments must have tried hard to make their machine better than the IBM PC.

Professional Computer
Texas Instruments, Inc.
P.O. Box 402430
Dallas, TX 75240
(800) 527-3500
List Price: $2,195 for basic unit with 64K RAM, keyboard, monochrome monitor, CRT controller, and single 320K disk drive. Extra disk drive $475, Winchester 10 megabyte hard disk $2295

CIRCLE 535 ON READER SERVICE CARD

Judging Appearances

The Texas Instruments Professional does, indeed, look similar to the IBM PC. Little more than the color scheme has been changed from the subdued IBM combination—the front faceplates of the TI are a darker, browner beige, and the rest of the cabinets are a harmonious lighter shade. The TI-PC is only slightly larger than the IBM PC, but it looks much more massive because of its squarer styling. The unit I tried had one double-sided, double-density disk drive and a 5 megabyte Winchester hard disk mounted exactly as would be expected for an IBM PC-XT. (Besides the 5 megabyte unit, 10 and 15 megabyte Winchesters are available for the Professional.) Even the power switch is located in the same place as it is on the IBM PC—at the lower rear of the right side of the cabinet.

The most apparent difference between the TI-PC and the IBM PC is in the keyboards—the Professional's keyboard is bigger and has more keys. Even at first glance it's obvious that TI took all the criticism of the IBM PC's keyboard to heart and rearranged nearly everything, from function keys to cursor controls.

Rather than making the numeric keypad do double duty as cursor controls, TI provides a separate pad for each function. Rather than squeezing all the keys together, TI has divided sections of the keyboard into functional units and separated them with wide, empty spaces. Rather than adhering to some new and unfathomable international arrangement of the alphabetic keys, TI has stuck with the typewriter placement and sizes (this is true for the Shift and Return keys as well). Rather than putting the function keys in two vertical rows to the left of everything, TI arranged its 12 function keys across the top of the keyboard, so that their positions might better correspond to the positions indicated on the monitor screen.

The TI keyboard even feels different from the IBM PC's, and it sounds different too. The TI Professional's keys require only a light touch—when your fingers are about halfway down, the keys finish the stroke almost unaided and almost without a sound. Instead of springs, the TI keyboard uses a resilient plastic membrane to support its keys, which are linked to the electronic system with magnetically actuated (that means nothing to wear out) Hall-effect switches, two per key.

As with the PC keyboard, the typing angle of the TI can be adjusted from 5 to 15 degrees, but unlike the PC's three discrete steps (0, 5, and 15 degrees), the TI keyboard can be adjusted to any angle in between by pressing the large tabs at the rear corners of the board.

Both color and monochrome (green) monitors are available for the TI Professional. Both use the same set of on-screen characters, which is less detailed than the characters on IBM's monochrome monitor but more detailed than IBM's color monitor characters. The TI Professional I tried came equipped with a color monitor.

If you think the IBM color monitor is impressive (and most people do), the TI will knock your socks off. The TI's on-screen images are sharper and more detailed that the IBM's while losing nothing in color or contrast. The TI Professional has a sharper picture tube, wider bandwidth hardware, and it devotes more

memory (and data) to graphics to get 720 x 300 pixel resolution on-screen (compared to IBM's 640 x 200).

Another inevitable result of TI's departure from IBM's graphics system choices is incompatibility—virtually no graphics software for the IBM PC can run correctly on the TI. (Of course, that's only a problem if your favorite graphics software is written only for the IBM PC.)

The Inside Story

Overall, the TI Professional seems sturdily built, pehaps even more so than IBM PC. Even the outer cabinet is made from heavier gauge metal—the TI case could do double duty as armor plating.

The Professional's inside layout looks vaguely familiar. Tucked into the right rear corner is a power supply. Two disk drives snuggled into the right front, and the left side was lined with expansion slots. The whole thing was beefier than the already sturdy innards of the PC. TI claims that the Professional's power supply can dish out more than twice the number of watts of the PC (133 versus 63.5 watts), but its heavier duty fan also supplies more noise. The spaces for expansion slots are longer and more numerous on the TI Professional (it has six compared to five on the IBM PC). Because TI has assigned different functions to the connector pins in its expansion slots, IBM expansion cards will not work in the TI.

TI will be first to tell you that besides adding a slot, it's taken other steps to solve one more often criticized aspect of the IBM PC—too few expansion slots for everything you might want to do. TI saves one slot by putting the disk drive support circuitry on the main board (one IBM PC slot must be devoted to a disk drive adapter). Likewise, a parallel port/printer adapter is built into the main circuit board on the TI so that no add-on expansion card is necessary. Rather than requiring two slots for a monochrome and color graphics board in applications where both are needed, the TI combines both functions on a multi-layer board that fits into a single slot. If you want to use just text, the board you use has a single layer of circuitry. For graphics, two additional layers of circuits snap on.

So far as that extra slot is concerned however, TI slips you a curve. There may be an extra expansion connector, but it's located near the front of the chassis and shares the same card width as one of the other connectors. It's suitable only for an abnormally short card, as is the other connector that shares its slot space. TI uses one connector in the slot for a serial/asynchronous port and the other connector, nearest the front of the chassis, for additional random access memory. The main board carries 64K of RAM in a single bank of 64K memory chips, and another 192K reside on the expansion card, for a total maximum system memory of 256K. This amount is puny in comparison to that of an IBM PC, which can be expanded to 640K of useful RAM memory. In experimenting, I discovered that the TI's memory expansion card is not keyed, which means that if you're not careful—or if you're looking for trouble—you can install it backwards in its slot. That's poor planning on TI's part.

Instead of requiring you to set tiny little internal DIP switches to tell the computer how much memory it has installed inside itself, the TI Professional uses a system of jumper blocks and pins, a more permanent, if less convenient, scheme.

Even with the Texas Instruments slot-saving design, expansion space disappears pretty quickly inside the Professional. Inside the test sample, other slots were swallowed up by the Winchester controller and the TI Voice Command cards. Currently, the problem is not a major one since no one except TI makes cards for Professional. But if the computer catches on and outside suppliers do make expansion boards for it, you're still likely to run out of slots very quickly.

The TI Professional is not a "closed" system. The company is not hiding the specifications and mysterious inner workings of its machine from anyone. A rather thorough technical reference manual accompanied the machine I tested, which was detailed enough so that anyone wanting to make enhancements or peripherals for the Professional could do so.

The Big Turn On

The *Operating Instructions* Manual that accompanies the Professional assumes no previous experience with computers. In fact, it begins with a complete history of computing from the Stone Age to the present day—in three paragraphs. Although my in-depth reading of both (yawn) found that the TI manual's contents are nearly identical to IBM's *Guide to Operations*, the TI manual was better organized for the beginner.

Push the Professional's power switch on and it's smooth sailing. Automatically, the computer runs through a quick turn-on and self-test procedure. The roughly 15-second wait is substantially shorter than the IBM PC's turn-on self-test (given the same size memory).

If the disk with the operating system on it is in the "A" drive, in a few more seconds the familiar "A>" prompt appears on the screen. Unlike the IBM PC, the Professional does not have BASIC already in its built-in memory so if no system disk is in the drive when you turn it on, an error results (number 0031).

The way Texas Instruments handles equipment failures sincerely flatters IBM. As does the IBM PC, the Professional comes with a diagnostics disk. A quick runthrough with the disk will either help find problems or will narrow the possibilities somewhat. As with the IBM diagnostics, however, once the problem is located that's all they tell you. The TI's helpful instructions only advise taking the offending piece to your dealer so that the dealer can come up with a credible excuse for flattening your wallet. If you don't want to go on a search-and-destroy mission inside your computer, taking it to the dealer is probably the best approach to equipment problems, nevertheless.

The TI diagnostics do outshine the

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IBM procedures in one area—the left side of the system unit. TI has added three different-colored light-emitting diodes (LEDs) to the Professional's main circuit board. While the computer is warming up, they flash and glow through slots cut in the cabinet. The pattern of flashes and which light remains on after the machine has settled down helps point out possible problem areas. However, I never had any problems with the Professional; if I had, it would have allowed me to evaluate the usefulness of this feature.

If you've ever had an encounter with a computer before, getting the Professional up and running should be a familiar experience. The now-ubiquitous MS-DOS operating system works exactly in the Professional as you would expect. From the time the DOS prompt appears, the Professional is essentially invisible. Rather than dealing with the hardware, you're actually working with MS-DOS, and the operating system and programs running under it work exactly the same as they do on any other MS-DOS machine—except it's a bit quicker than the IBM PC. (Should you prefer CP/M-86, that operating system is also available for the Professional.)

The Software Situation

Perhaps the biggest similarity between software written for the Professional and software written for the IBM PC is the packaging. The software for both computer systems comes in binders-in-boxes of almost exactly the same size. Even the names on some of the packages are the same. But the Professional *will not* run software written for the IBM PC, and vice versa.

In choosing to make the Professional almost completely incompatible with the IBM PC, Texas Instruments denied its customers access to one of the largest existing personal computer software bases. The selection of software now available for the TI Professional includes only the works of major suppliers that have received TI's blessings. That means you can run any language you want as long as it's Microsoft BASIC. Nothing else is available. As I write, *WordStar* has just become available; that brings the number of word processing programs that can run on the TI to two. The other is the *EasyWriter II/EasySpeller II* combination. Spreadsheets include only *Multiplan* and Lotus's *1-2-3*, with some additional database help from *pfs:File* and *pfs:Report*. Missing are all the software tools that have made the IBM PC so useful.

The software available for the TI Professional includes only the works of major suppliers that have received TI's blessings.

Perhaps the greatest software inconvenience occurs in hard disk-based TI Professional systems. The standard Professional operating system is MS-DOS, version 1.1. Among other things, using that version means no volume labels for disks and no subdirectories to make mile-long hard disk directories manageable. I would expect with the introduction of new 10- and 15-megabyte Winchesters for the Professional that use of MS-DOS 2.0 is not far off.

The software incompatibilities between the TI Professional and the IBM PC are greater than you might think. Even some BASIC programs cannot be shifted between machines—the two computers use different methods of handling their screen displays so that color and cursor positions may take on strange aspects when programs go from one machine to the other.

On levels lower than BASIC, the incompatibilities are even greater. The addresses or memory locations that various system parts are assigned vary

between the machines to a great extent: while one computer might assign a specific address to the monitor screen, when told to route data there, the other computer might dump it into a giant black hole. Theoretically, neither arrangement can be said to be superior, such arrangements are mostly matters of convenience (for the designers) and taste. From the standpoint of practicality, however, the arrangement with the most support and software available would be the better choice.

Some tiny differences give the TI Professional a speed edge over the PC, however. The system clock for the TI, for instance, races along at 5 megahertz (compared to the IBM PC's 4.77 megahertz), so if all else is equal, the TI can think about 5 percent faster. If all else is not equal, the TI, in many applications, outruns the PC by a wider margin. Add to the internal supercharging the TI keyboards's potential for an increase in data input speed, and the Professional can be a major time saver in intensive business applications.

It's impossible to predict how much software will eventually become available for the Professional. Certainly IBM PC programs can be rewritten for it. But other 8088-microprocessor-based computers that are not PC-compatible—like Digital Equipment Company's Rainbow 100—are also competing for the software publishers' time. Many more Professionals will have to be sold before it becomes worthwhile for program publishers to invest the time necessary for the conversion.

By adopting the 8088 as the basis for the Professional, TI affirms that IBM's choice for the PC was a good one.

Flattering Imitation

The IBM Personal Computer has probably been criticized most for the microprocessor that it is built around, known to the world as the Intel 8088. Many engineers call it "primitive," and to hear them talk, you'd think it had been carved from stone by Neanderthals. Now another company that makes a well-regarded 16-bit microprocessor has decided to put the 8088 into its Professional Computer, which suggests that it's time to reconsider the criticism. By adopting the 8088 as the basis for the Professional, TI affirms that IBM's choice for the PC was a good one.

Every major part of the Professional echoes IBM's design choices. But, TI decided to do IBM one better by sanding down the rough edges and then putting its name on the front.

The big question is whether you should put that name in front of yourself on your desk. If price is your only concern, the TI wins hands down. But if you demand flexibility, expandability, and a large software base, the choice today is still the PC. The Professional does have the capability to be as versatile as the PC, but so far this capability is unrealized.

On the other hand, if you're going to buy a hundred workstations for your company, the Professional is a captivating choice. Odds are you're going to want customized software for your own applications, so the availability of canned programs will be much less important. The dollars saved on the initial outlay will be very significant. And multiplied a thousandfold, the speed and productivity increase offered by the TI may make a substantial difference on your bottom line. ■

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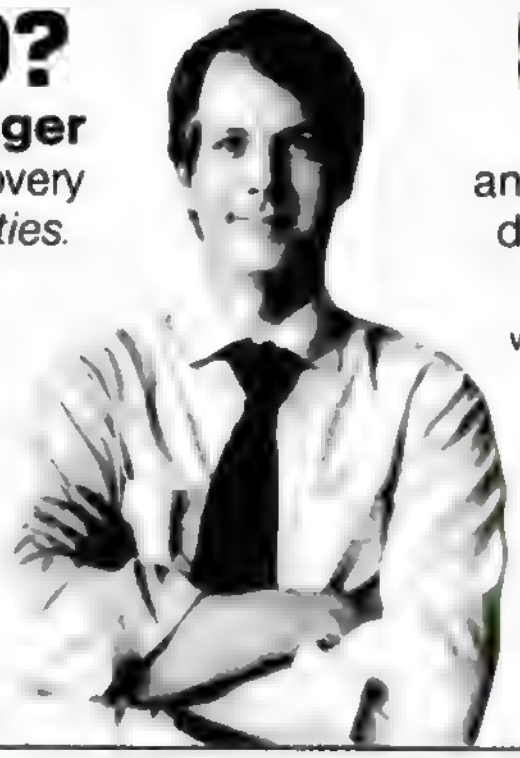

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Game Menus: A Fix For Word Junkies

If zapping spaceships leaves you longing for something to satisfy your word cravings, here is a potpourri of games with everything from quotations to cryptograms for you to attack.

As a writer and reporter, I am deluged by words every day. Printed words. Typed words. Words on my monitor, in newspapers and magazines. Words in letters, reports, press releases, and books. Words, words, and more words.

After a long day of working with words until my eyes turn blurry, what I *should* want to do—logically—is settle down in front of my IBM PC to play games—the kind with spaceships zapping, spiders webbing, munchers mazing, froggies hopping, or small planes weaving in for a landing. Right? Well, maybe not. To tell the truth, I'm addicted to words. I am a self-confessed word junkie. The morning news on the radio is just a temporary stopgap until I can get to my newspaper. Sunday mornings I dare not sleep until 11 a.m. lest *The New York Times* be sold out, leaving me crossword puzzleless.

So what can I do—and what can you do if you're also a word junkie—when it comes time to boot up?

Here are four possibilities: one that combines typing lessons and space combat, and three mind exercisers that allow you to play with words to your heart's content.

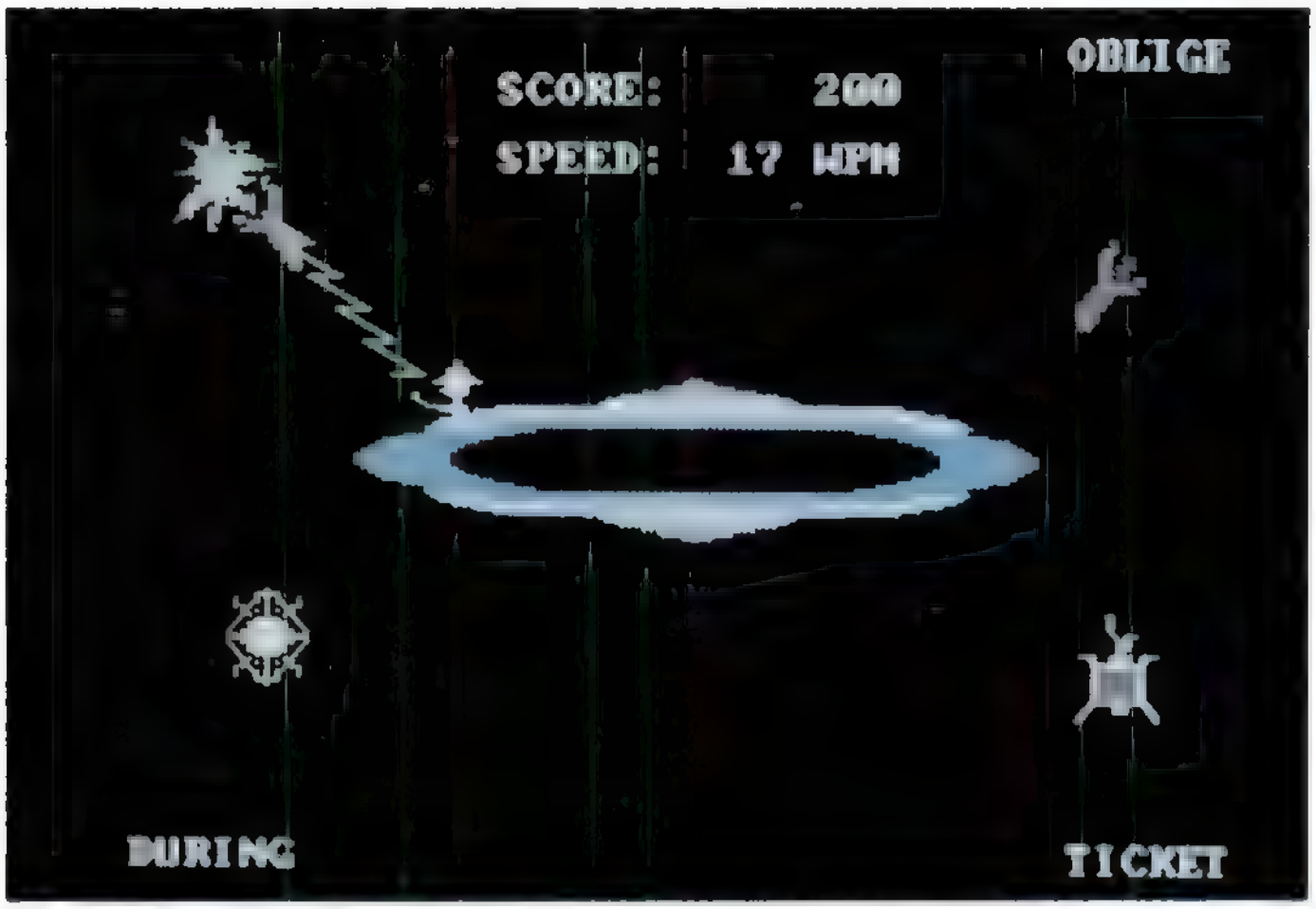
MasterType
Lightning Software
P.O. Box 11725
Palo Alto, CA 94306
(415) 327-3280
List Price: $49.95
Requires: 64K RAM, one disk drive, color or monochrome monitor.
(Program will not operate on PC-XT.)

CIRCLE 708 ON READER SERVICE CARD

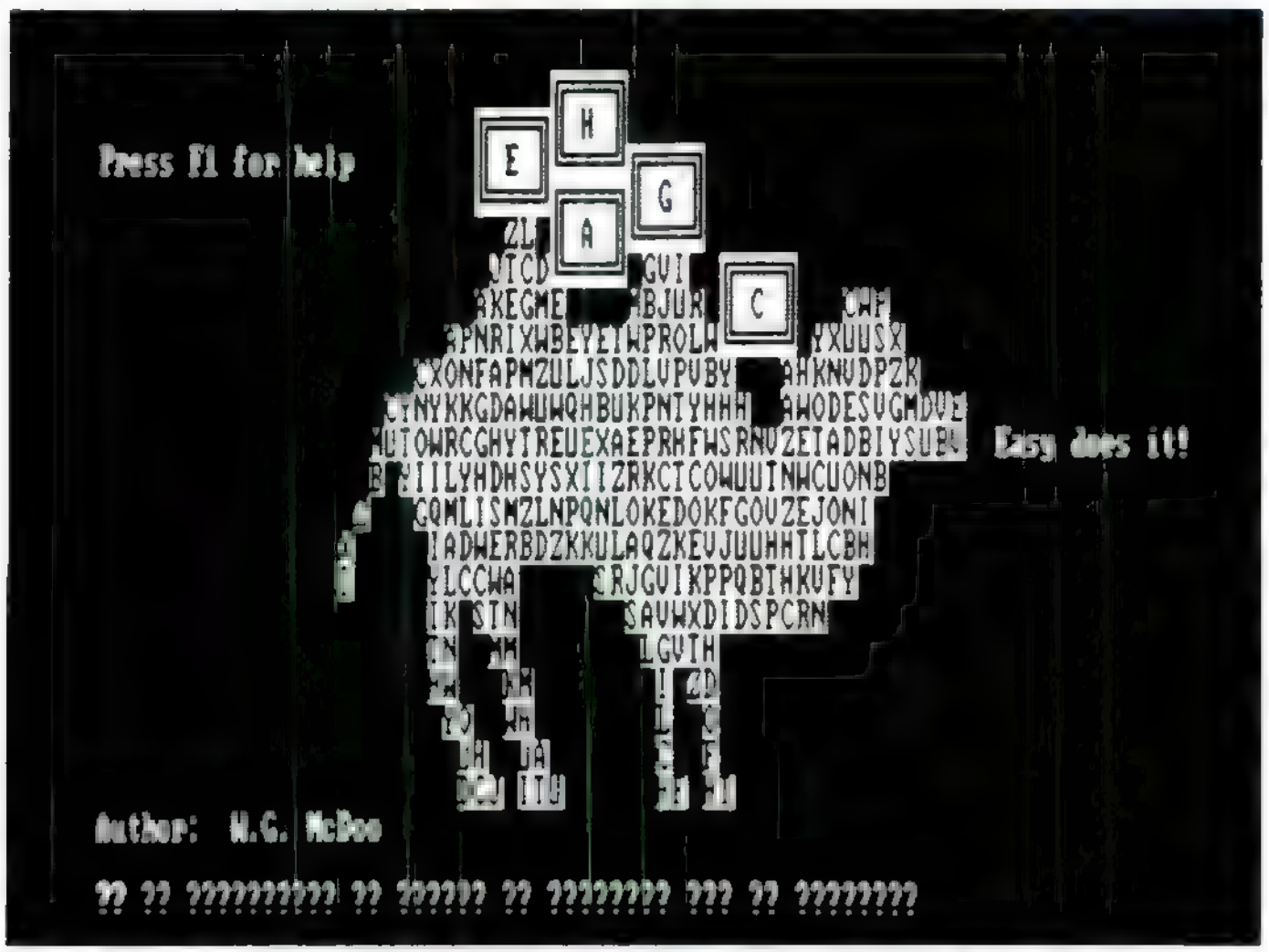
Would you believe that learning to type could get your adrenaline pumping? If you're skeptical and want to develop or hone up on your typing skills, try *MasterType*. As a combat game, it's not very complex, but it certainly beats the atmosphere of boredom that permeated my high school typing class, and it undoubtedly provides a more interesting approach than those teach-yourself-to-type records.

The underlying concept is simple: As you learn to type, you're also defending your command ship from the assault of atomic meteors, satellites, and missiles. While mistyped or slowly typed words unleash enemies ready to blast your command ship into oblivion, the words you type swiftly and accurately become allies, wiping out your assailants.

As a typing tutor, the 18-lesson pro-



A screen from *MasterType* showing current score and typing speed.



A screen from "Load The Camel's Back," one of the sub-games from *Quotrix*. In this shot, the player has made five wrong guesses adding five boxes to the camel's back.

gram follows fairly traditional patterns, starting with the eight familiar home keys of A S D F ; L K J. You proceed at your own pace to learn all the keys and how to combine letters to type words. The self-booting disk allows you to select lessons in any order. (At the end of the 14-page manual is an appendix that lists the contents of each lesson.) You can regulate the speed at which you will be attacked; you can start as a greenhorn and move up as your skills increase.

You can view the list of 40 words, numbers, symbols, or, in the earliest lessons, individual letters that a particular lesson will use. In the last lesson, perhaps as another reminder you're using a PC keyboard and a computer to learn typing, the list consists of 40 DOS and BASIC commands such as INKEY$, CSRLIN, PEEK, and CHKDSK.

MasterType also allows you to design your own lessons, which can then be stored either on the program disk or on a separate disk. When you write your own lesson, you can enter an explanatory text that describes the lesson and offers instructions, even encouragement, to those who will use it. Your custom lesson comprises 40 words from one to nine characters in length.

Like other combat games, *MasterType* has rules. First, you're supposed to type only the letters, words, symbols, and punctuation marks you see in each of the four corners of your monitor. You can type them in any order, but because the enemy attackers come from each corner too, you must try to knock out the closest and most threatening missiles first by typing the characters in that corner. Each successful shot will move that attacker back to its corner where a new word will then appear, propelling the enemy back to-

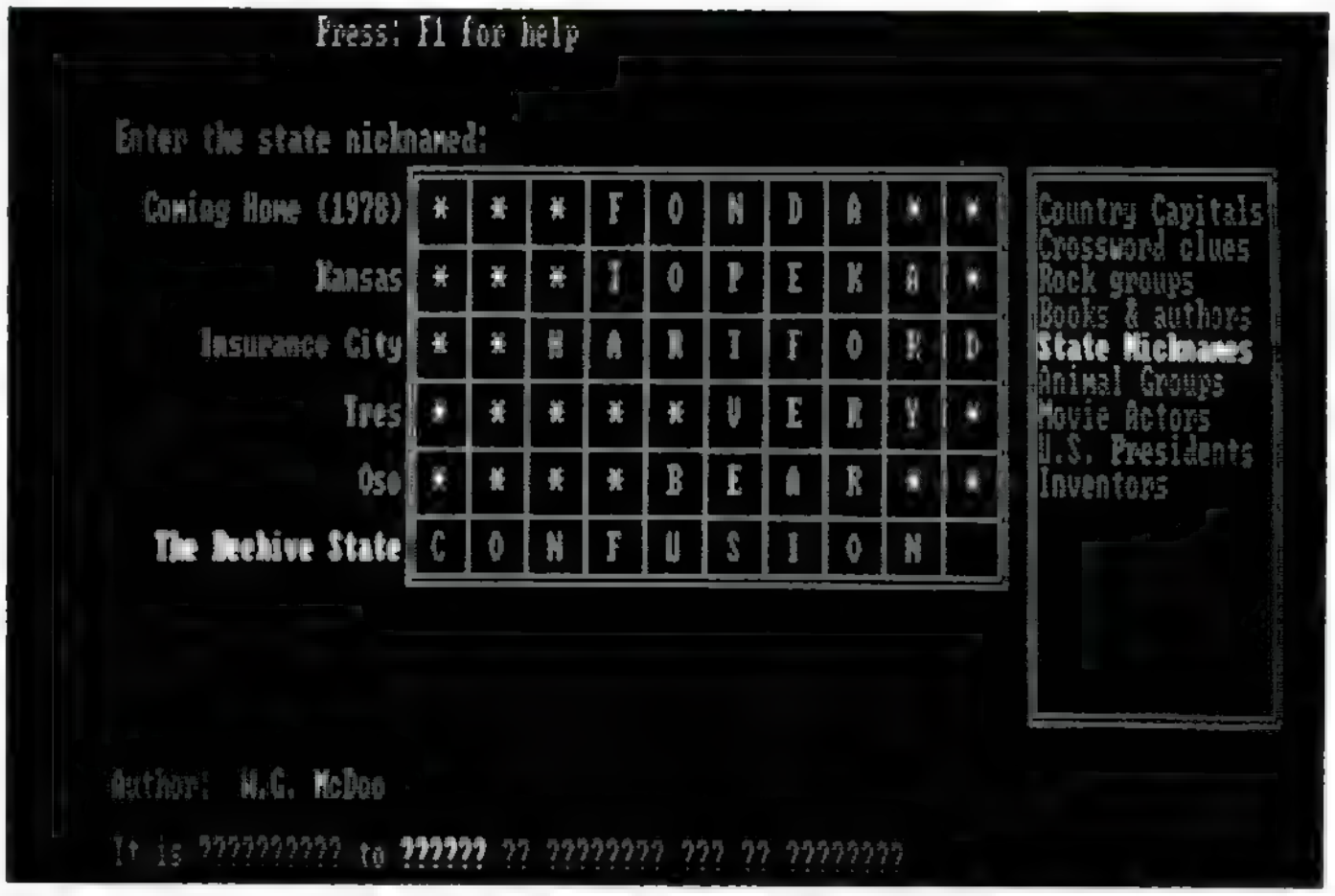
ward your command ship in the center of the screen. Second, you must remember to push the spacebar at the end of each word, unless you're using the beginner mode. If you type the word correctly, the spacebar triggers a laser to zap the appropriate attacker.

What happens if you miss? A mistyping will cost you some points, but a missile that penetrates your digital defenses will destroy your shield for that quadrant. In that vulnerable state, your command ship will explode and disintegrate if a second missile hits from that quadrant. Accompanying that event is a brief musical dirge and the disheartening message, "The words won." Don't say you weren't given fair warning. As the manual warns at the beginning, "The universe is not always kind to those who type slowly."

Unlike other combat games, however, *MasterType* has three rules that are important for the program's primary purpose, teaching typing to tyros. These are: "Don't leave home," "Put your best finger forward," and "Don't look before you leap." (I confess to one frequent violation: peeking at the keyboard.)

In addition to scoring points, the game also calculates your speed in words per minute and tells you how many words you typed correctly. There are reassurances, such as "Your score is very good" or "Your score is great." However, you can also get the computerized version of a human teacher's criticism: "Your score could use some improvement. You should try a lower speed goal." At the end of each lesson, you see a screen with your score, average and final speeds, the number of words typed and destroyed, the number of errors, and the previous high score for that lesson.

MasterType's documentation is easy to follow, although the references are to Apple and Atari. It contains nary a word about the PC, except for a sticker on the cover that says "For IBM PC 64K." (It's a minor irritant with no practical effects, and the company says the manual is being rewritten to include the PC.) The graphics



This screen shows a trivia quiz from "Pick and Solve," one of the sub-games from *Quotrix*. The categories from which you choose are in the box at the right.

are not spectacular in comparison to many combat games on the market today, but the others of course, are not geared to teach you how to type while you play. *MasterType* comes with a reversible disk. Using the front side, I ran it on both my Princeton HX-12 color monitor and on my Amdek 300G monochrome monitor with a color/graphics adapter. By booting with the reverse side, it will run on a monochrome monitor without an adapter.

Teaching yourself to type this way will require self-discipline to master the lesson you're currently working on. To build up speed and stamina, you'll have to practice longer passages and texts on your own, either on your PC or a typewriter. If you concentrate, with *MasterType* you'll pick up basic typing skills without the tedium of formal classes and enjoy shooting down enemies at the same time.

***Quotrix* Infosoft, Inc.**
10175 SW Barbur Blvd., #202B
Portland, OR 97219
(503) 244-4181
List Price: $34.95
Requires: 64K RAM, one disk drive, monochrome or color monitor.

CIRCLE 707 ON READER SERVICE CARD

Clarence Darrow said, "History repeats itself; that's one of the things that's wrong with history." If you play *Quotrix*, one thing you won't find are quotations that repeat themselves, unless you have the will power, stamina, and time to play the game about 500 times. There are that many quotations in this game, and they appear sequentially, not randomly. *Quotrix* is a one-player or two-player mind expedition in which you must identify quotations by famous people. Fortunately, you don't have to do it the other way around. After all, the odds are slim that most PC users know that it was Queen Victoria who observed, "He speaks to me as if I were a public meeting."

"I'm picking out a quotation for you," the program announces on the screen. Then you're given the name of the author and a series of question marks to indicate the number of words in the quotation, as well as the number of letters in each word. For example, Darrow's statement shows up as "??????? ??????? ?????; ????'? ??? ?? ??? ????? ????'? ????? ???? ???????." Each quotation is solved on a word-by-word basis. Dedicated function keys F2, F3, and F4 are used to indicate which word you want to work on. You can try to

guess a word by typing its letters. If you're right, the correct word will replace the question marks, and you can go on to another word. However, the odds are poor; you'll get few, if any, words that way. One-letter words are undoubtedly the easiest ones to try. You can use "a" or "I," and I usually try "the" for "???." If you make a mistake or if you don't want to guess, you must "play" the word. That means one of three sub-games must be used to work out the word; the program, not the player, selects which of the three he wants.

"Load The Camel's Back" presents you with a two-humped camel, composed of letters, wagging its tail and saying "Humph!" Now you guess the letters of the word. Each mistake costs points and adds a block with the wrong letter to the camel's back. As the load grows, the camel quips such messages as "Getting heavy," "Careful," and "Easy does it" until you exceed its maximum carrying capacity of six boxes. That breaks the back of the camel, who will tell you on the screen, "Oomph!" If you overload the trusty beast, you'll get the word filled in but no points.

"Pick and Solve" is a trivia quiz with categories such as presidents of the United States, French words, Spanish words, state capitals, and rock groups. For example, you may be asked to enter the "last name of the president associated with the War of 1812" or the English meaning of the Spanish word *enfermo*. You select one category for each letter in the word you're trying to solve. *Quotrix* aligns the correct answers in a grid to spell out the mystery word in a vertical column. You earn points for correct answers, and the skill level you selected for that quotation determines how many guesses you get for each trivia question.

With "Word Jumble," the letters of the word that you're trying to solve are mixed up; your mission is to rearrange them. The arrow keys on the PC's numeric pad move the letters and, unlike the other two sub-games, "Word Jumble" is timed. How long you get depends on the length of the word and the skill level you have chosen.

Quotrix comes on a single disk, and the manual explains how to transfer DOS to the program disk so that it will self-boot. You're given a main menu that uses the PC's dedicated function keys to get you the appropriate sub-menu to play, set the number of players, reset scores and skill levels, or quit. A magic wand with a flashing star at one end guides you through the menu. You can use the main menu to call for on-screen help. A high-intensity vertical bar indicates which of the six skill levels you're on, from beginner to expert to, finally, master. However, the skill level only affects how you play the sub-games, not the difficulty of the quote assigned to you. Players can save their best scores on the disk.

While mind-bending is *Quotrix*'s strong point, graphics is its greatest weakness. The camel is as graphic as the game gets, and my 7-year-old son can draw a camel freehand that is as good as *Quotrix*'s. I played *Quotrix* on both an Amdek 300G and a Princeton HX-12, and the program ran well on each. This is one game where a color monitor is no real improvement, because the only real color is the flashing star on the magic wand.

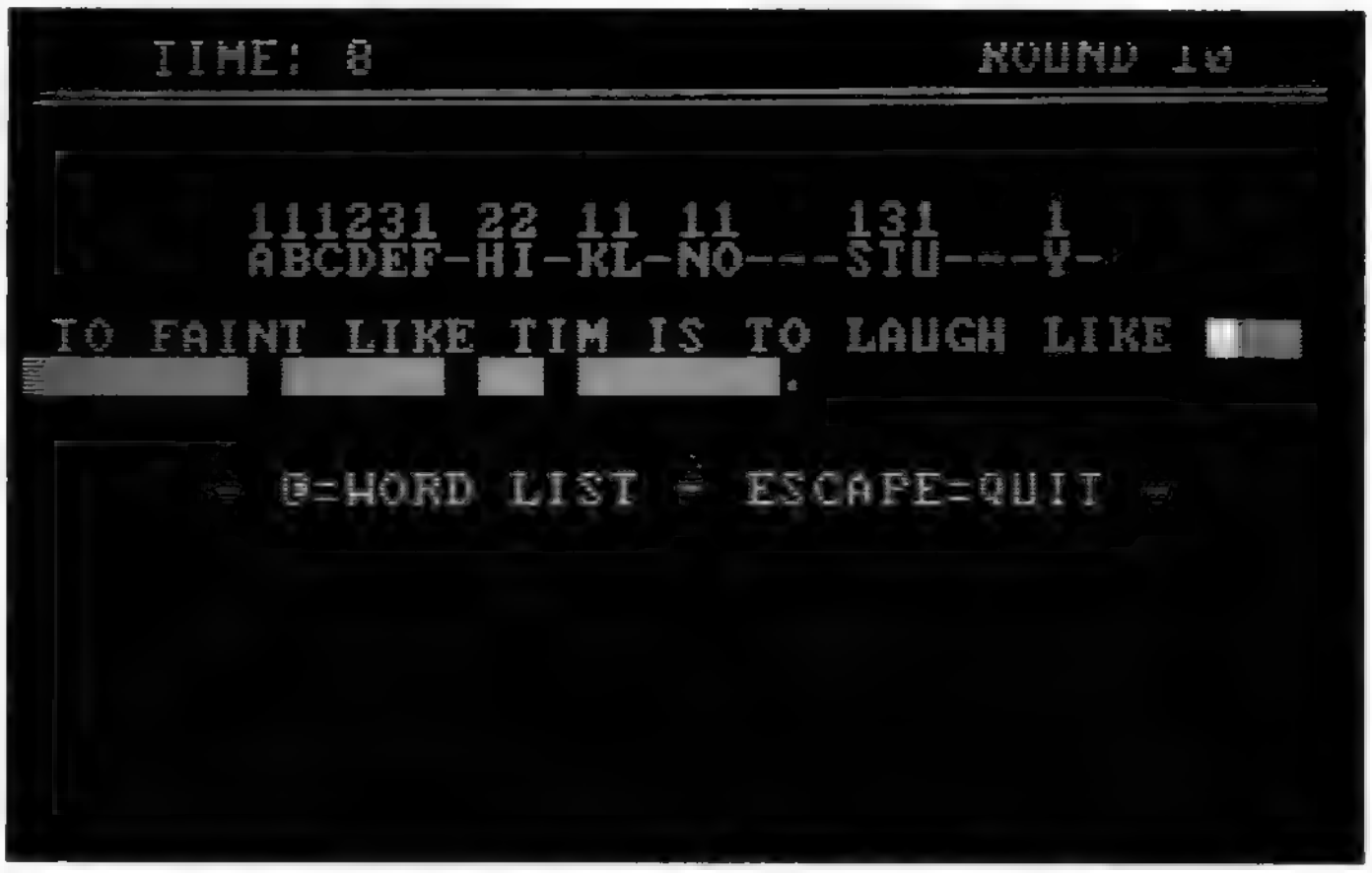
The most irritating flaw of *Quotrix* is that you won't learn the solution to the mystery quotation if you decide to quit in the middle of a game. The manual doesn't have an answer section, either. That means you have to get all the way through a round to learn the answer—or play about 500 times more until the same quotation comes up again. However, the 14-page manual is well-written, easy to follow, and includes illustrations.

The bottom line: *Quotrix* is fun and mentally, if not visually, stimulating. Watch out for its addictive character though—if you like words, it's hard to play just one round.

An illustration from *Crypto Cube* in the beginning level showing completed side on "Easy Animals." The Wuzzle can be seen at the right under the cube.

Crypto Cube
DesignWare, Inc.
185 Berry St., Bldg. 3, #158
San Francisco, CA 94107
(800) 572-7767; in California (415) 546-1866
List Price: $39.95
Requires: 64K RAM,one disk drive, color or monochrome monitor with color graphics adapter.

CIRCLE 706 ON READER SERVICE CARD



A partially completed sentence from "Alphagrammarland," part of the *Jabbertalky* quartet. Above the sentence are two lines showing the number of those letters of the alphabet necessary to complete the sentence.

What has four sides, lots of small squares, and a Wuzzle? If you guessed anything but *Crypto Cube*, you're wrong. Don't worry if you missed the answer. You might as well get used to being wrong—that's likely to be a common occurrence when you're playing this game.

Crypto Cube is a puzzle with 20 words hidden somewhere on the sides of a cube. The words are arranged crossword-puzzle style in vertical or horizontal columns. Your job is to rack up as many points as possible by correctly guessing which letter is hidden in each square. The game comes with an auto-booting disk and is suitable for one or two players. The main menu also allows you to view a short demonstration before beginning play.

The game comes with ready-made puzzles on 50 topics, such as "Transportation," "At the Beach," "Months and Days," "The Comics," "Latin Origins," and "African Nations." Each puzzle has 20 words that vary in length and difficulty from puzzle to puzzle. Vocabulary levels range from age 8 to adult. The youngest players will be more comfortable with a subject such as "Easy Animals" (cat, tiger, and moose, for example) than with "Physics" (angstrom, ohm, and quark) or "Computers" (cpu, bytes, and buffer). The lists of topics appear in groups of 10 on the screen. The player selects a puzzle by number.

Once you've made your choice, you're given the option of seeing the word list; you can also call up the word list during a game. I played several times before succumbing to temptation, but for young players especially, the word-list option can ease the frustrations *Crypto Cube* can generate.

The up and down arrows on the numeric pad are used to pick a square. When you hit the spacebar you'll see what's in it. It's like a quiz show contestant guessing what's behind the curtain. If it's blank, the square will color itself in. If it's a vowel, the vowel will appear, and you earn five points. But if it's a consonant, you'll get a question mark in the square and must guess at least once to become free to move on. A wrong guess costs you five points, and a correct answer wins you ten. Points can quickly disappear as you make repeated stabs in the dark, so it's good strategy to fill in as many blanks as possible to provide guidance on word length. Sometimes you'll hit a bonus square that fills in an extra square on the side you're playing and one square on the next side.

The screen tells you what side of the cube you're playing on and how many letters remain hidden on each side. You can rotate the cube at any time, watching it graphically re-create itself and later return to a side that is incomplete. If you finish a side, the cube automatically rotates to the next one.

If you get bored with the configuration for a particular puzzle, the program permits you to order a new arrangement of the same words, a process that can take up to 3 minutes. When the screen asks, "Do you want to have the computer make a NEW puzzle with these words?" you enter Y. The screen then provides a running account of how many words have been stored in that new format and how many are still left to do.

Crypto Cube's versatility allows the user to individualize puzzles. You first create a new data disk to hold user-made puzzles; you can use an unformatted blank disk to do so. A menu also lets you create or change word lists and rename puzzles. If you have children in school, you can create a puzzle with spelling words, science terms, German words, or any other theme. The maximum word length is ten characters. If you have a hobby not covered by a ready-made puzzle, you can develop a list with appropriate words to test yourself or fellow hobbyists. With user-created lists, you can let the computer generate the puzzle or you can make it by hand, moving square by square and filling in the letters on a blank cube.

All this time, you've probably been wondering what a Wuzzle is. A Wuzzle is your *Crypto Cube* guide, a small character with a squarish head—appropriate for a cube game—and big feet. It advises when you've hit a bonus square by running across the screen to the accompaniment of a musical flourish. And when you uncover a question mark, the trusty Wuzzle will order you to "guess a letter."

Documentation is good, and so are the graphics, which showed up clearly on both types of monitor. The folks at DesignWare, the maker of *Crypto Cube*,

are accessible through a toll-free number if you have any problems or questions. California residents can call collect.

All in all, I found *Crypto Cube* challenging and engrossing. And as a frustrated veteran of many almost-finished crosswords, I particularly appreciated the opportunity to reshuffle the puzzle when I got stuck. Skill? Some. Luck? Some. Words? Lots.

Jabbertalky
EPYX/Automated Simulations, Inc.
1043 Kiel Court
Sunnyvale, CA 94086
(408) 745-0700
List Price: $29.95
Requires: 64K RAM, one disk drive, color or monochrome monitor, color adapter card.

CIRCLE 705 ON READER SERVICE CARD

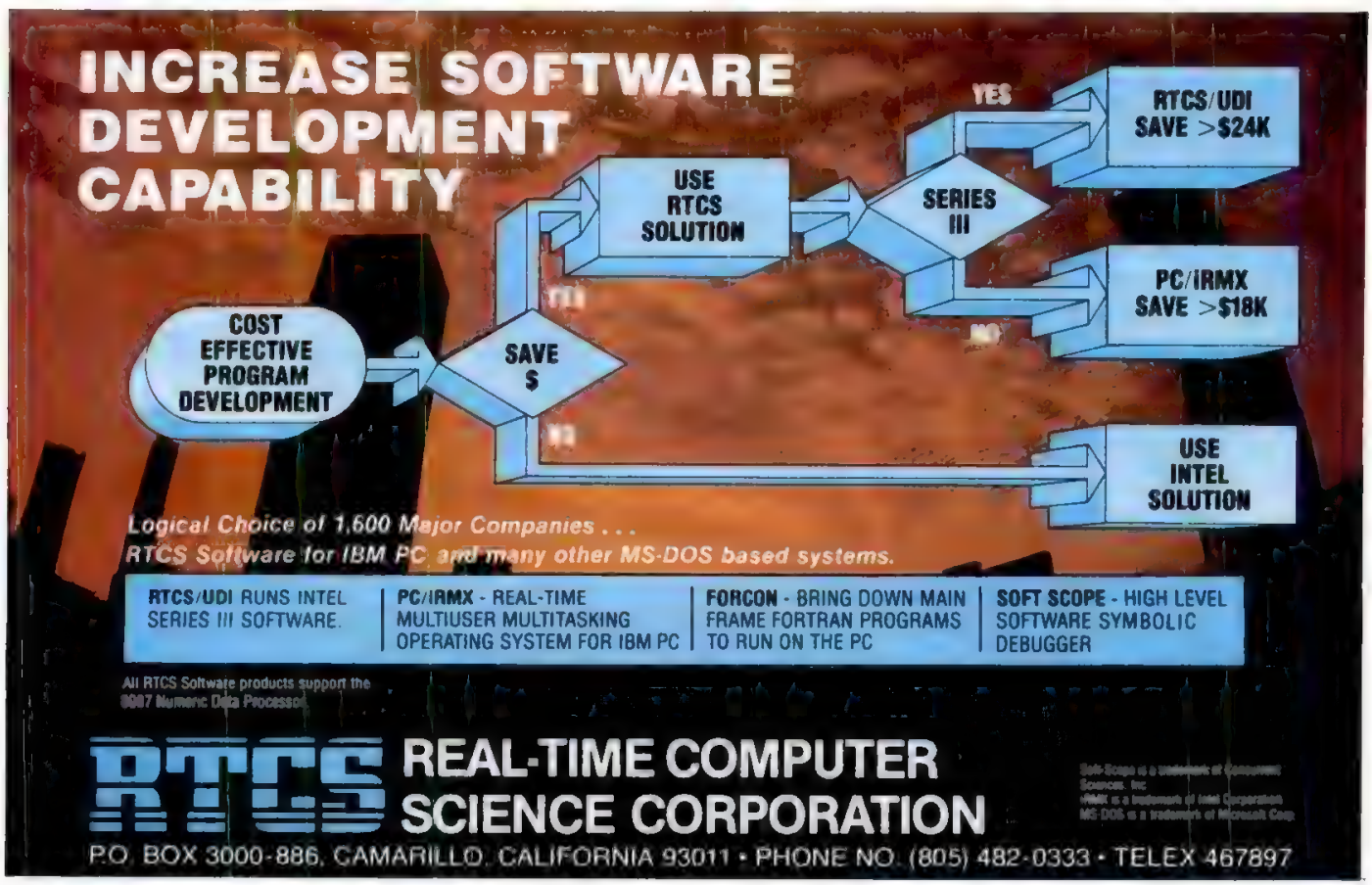
When *Jabbertalky* arrived, I eagerly unwrapped the package and started reading through a most amazing manual written in a style that can only be described as Lewis Carrollian. Terrific, I told myself. To those who may not recall Alice's adventures, perhaps this excerpt from the manual will jog the memory: " 'Who is the Jabbertalker?' you ask. Only the most venerable, ancient, and grammatically impeccable master of wisdom and nonsense ever to scroll across the monitor. 'I am the Jabbertalker,' said the Jabbertalker. 'Never vague is never surprised. And, by the way, good night.' "

From there, it was on to the game. And, alas, to disappointment.

Problems began when I tried to follow the directions to make the *Jabbertalky* disk self-booting. "Incompatible system size," my screen told me. Four long-distance calls to California elicited repeated promises that a replacement would arrive promptly, and it did, 2 weeks later. That one worked, sort of, except for sometimes.

I began my *Jabbertalky* journey through a main menu called "the great door" that contains four program choices. Using the preset *Jabbertalky* word base, or any vocabulary you create yourself, it generates properly structured, pithy statements, such as, "Destiny is the kumquat of mercy" or "A pure child is a cruel friend." The novelty lasts for a few minutes and provides a bit of truth beneath the nonsense, but it is not the stuff of which true entertainment is made.

Two other game options in the package, "Alphagrammarland" and "Cryptogrammarland," offer more challenge and can be played by more than one person. In



CIRCLE 443 ON READER SERVICE CARD

both, you can select among eight difficulty levels and will be told scores after each round, such as "Jasper got it with a score of 39!" However, at that point, on one occasion, I got "Illegal function call in 2900," followed by the BASIC "OK" prompt, forcing me to reset my PC using the Alt/Ctrl/Del combination. While working on either of these games, you can summon to the screen the word lists being used, categorized by parts of speech, such as reflexive verbs, proper nouns, prefixes, or superlatives. By hitting the spacebar, you can clear the word list from view and continue playing the game, although here, too, I ran into problems. At times I couldn't get rid of the list to proceed, and the Escape key didn't work either. Back to the Alt/Ctrl/Del triumvirate to reboot the program.

Traveling through "Alphagrammarland" requires an ability to fill in the blanks to figure out a sentence. To help you out, you're told how many of which letters in the alphabet are in the sentence. Confronted with 4 As, 2 Cs, 1 D, 3 Es, 1 H, 2 Is, 1 L, 1 M, 1 N, 2 Os, 1 P, 1 Q, 3 Rs, 3 Ss, 2 Ts, and 2 Us, along with the proper spacing of words, it's possible by trial and error to determine that "A cruel parent is a squeamish doctor."

"Cryptogrammarland" is a computerized way to do cryptograms. It provides sentences in which you must substitute letters to solve the puzzle. At the beginning, aspiring code-breakers will hear a loud beep and be told "bad input" when they try wrong swaps. At higher levels, the Jabbertalker doesn't bother to give those helpful cues when you're wrong. To make things more difficult in the fifth, sixth, seventh, and eighth levels, word spacing may be deliberately set wrong, and you gain the capability to reverse words and move spaces.

The fourth game option is "Jabbergrammarland," a utility to change, delete, edit, and add words and create personalized vocabulary lists for use in the other games. You also have access to the code for sentence patterns—the series of letters and numbers that determine what categories of words are combined at different difficulty levels to create the randomly selected sentences used in the games. Alice, in the manual, compares it to ordering "One from Column A and then one from Column B" in a Chinese restaurant.

There are no graphics, aside from illustrations in the manual, and no color.

The final verdict is don't bother with *Jabbertalky*. Spend the time reading Lewis Carroll instead. ■

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Monitors: A Look Behind The Screen

The most popular types of microcomputer monitors use raster scan technology to bring light and life to the PC's screen. Here's a look at how they work.

When you are buying a PC, there are a myriad of factors to consider. You look for software applications to suit your needs. You compare dot matrix and letter-quality printers and examine a host of other add-on devices. But what really catches your eye is the visual display on the PC's screen. After all, it's the monitor that provides the link between you and your PC. But have you ever wondered what goes on behind the screen? Here's a look at some of the technology that enables you and your monitor to communicate.

The most popular types of monitors manufactured today use raster scan technology, which means they produce a continuous fixed scanning pattern across the screen. One major reason for their popularity is the maturity of this technology; these monitors can handle numerous gray-scale levels, provide bright pictures, and can easily be designed to handle high data rates.

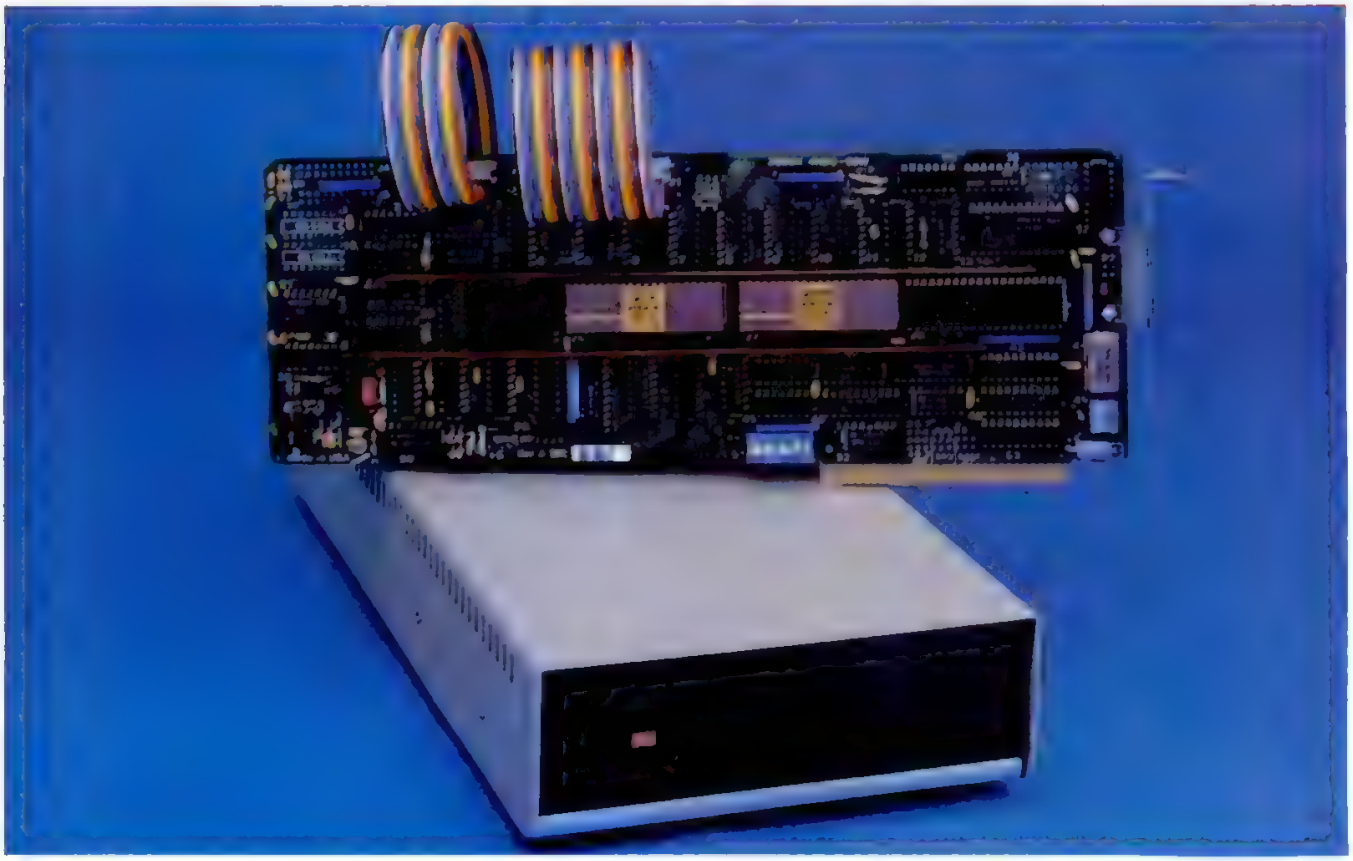
The maximum resolution achieved by a raster scan monitor is 1,024 by 1,024 picture elements, known as pixels (the measure of the smallest segment that can be resolved and controlled by the display system). Although by today's standards this resolution is considered quite high, these monitors cannot handle high-motion applications such as flight simulators or radar displays. Nonetheless, the bottom line is that the raster scan monitors provide the best price-to-performance tradeoff, especially in the color arena.

The Scanning Mechanism

Here's how raster scan technology works. A cathode-ray tube (CRT) on one end consists of a glass bulb (the screen), which has a phosphorous coating on its inner surface (see Figure 1). At the other end, the narrow end (the neck) contains an electron gun. The electron gun emits a stream of electrons called an electron beam. This beam strikes the phosphorous surface of the tube and illuminates a small area referred to as a pixel dot for a short period of time.

The positioning of the dot is accomplished by deflecting the electron beam, which is magnetically sensitive. Two sets of electro-magnets (deflection coils) mounted on the neck of the tube provide the mechanism to move the dot in both the horizontal and vertical directions. The dot position is proportional to the linear voltage applied to the deflection coils. Therefore, by applying continually increasing voltage (ramp signal) to both the horizontal and vertical coils the dot will zig-zag

THIS IS IT!



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across the face of the screen.

Due to the nature of the phosphorous compound, the beam leaves a trail as it moves across the screen. The duration of the visible trace depends on the characteristic of the phosphorous.

The beam starts at the top left-hand corner of the screen and travels toward the right. Once it reaches the right corner, it quickly retraces back to the left. This pattern continues until it reaches the bottom right-hand corner of the screen. Once there, it retraces back to the upper left-hand corner (referred to as home position) starting the vertical scan again.

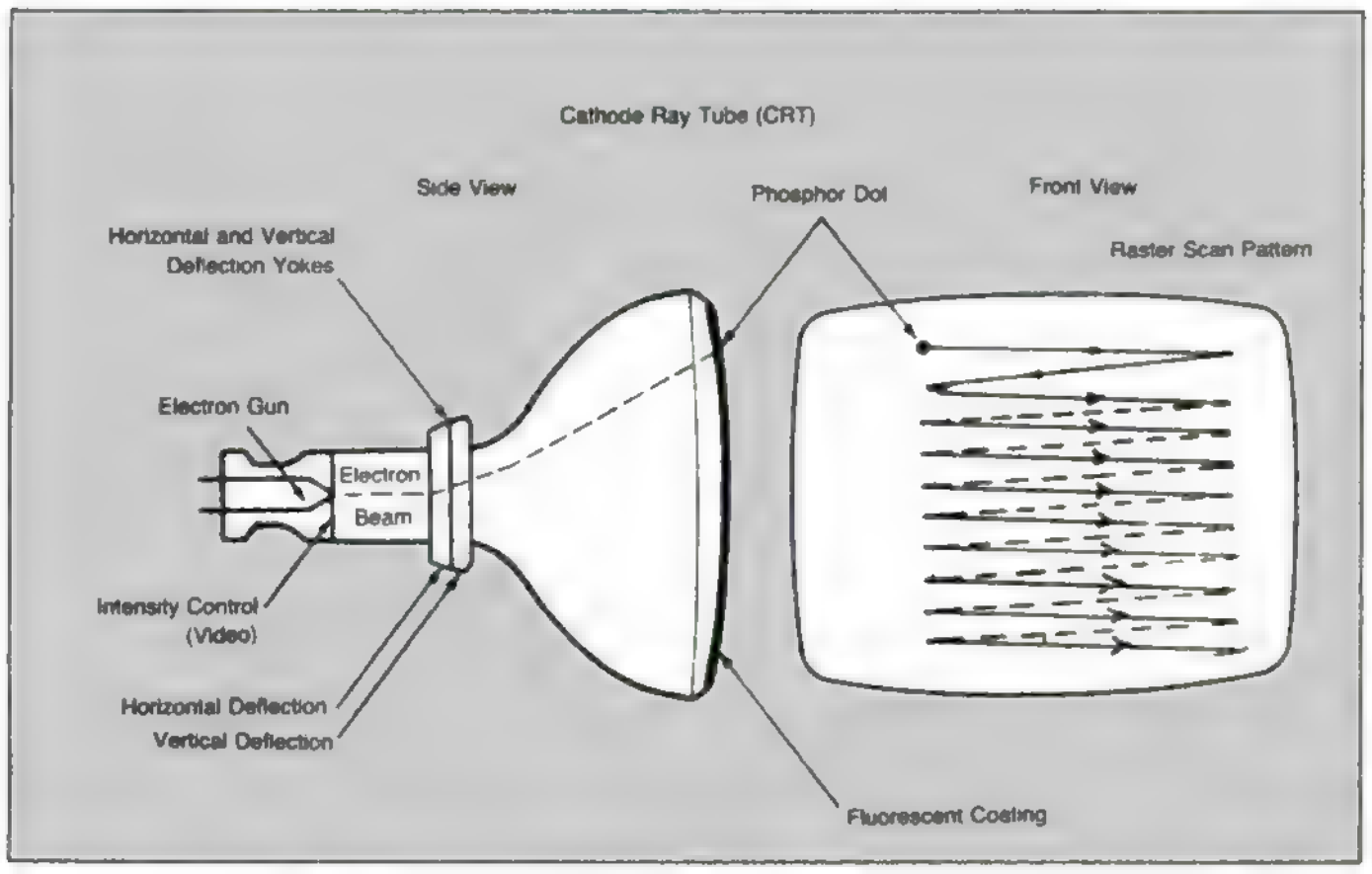

Figure 1: *The side and front views of a cathode-ray tube.*

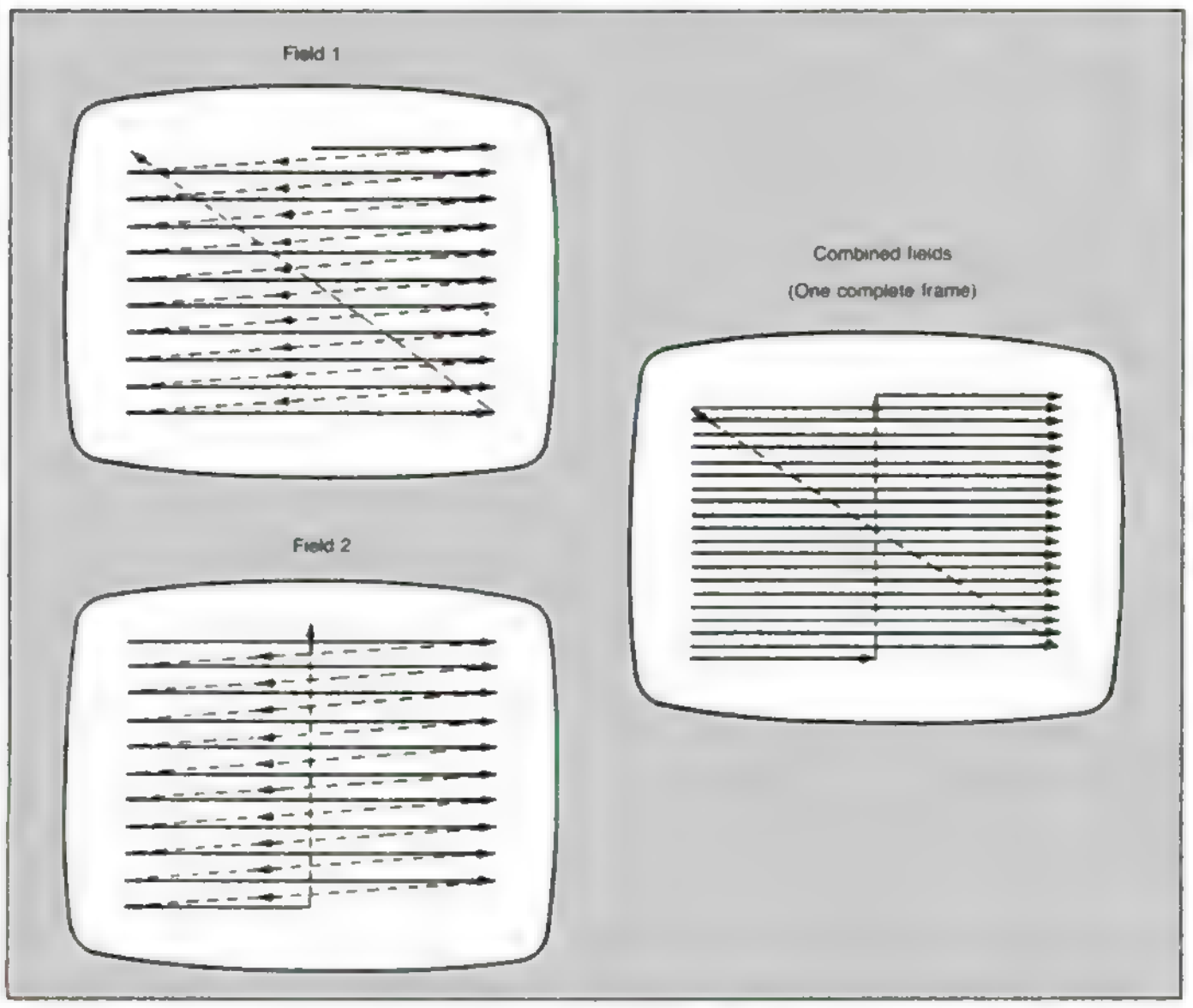

Figure 2: *The interlace scan method doubles the number of lines drawn on a screen. Each vertical sweep is a field; together they make a frame.*

The repetition rate, known as refresh rate, of this pattern is very important. If it occurs too slowly the human eye will be able to perceive flicker. Therefore, it is important that the pattern is drawn above the flicker level of the human eye. This requires a refresh rate of greater than 30 times per second (30 Hz).

In order to effectively utilize 30-Hz refresh rate, a method called interlace scan is employed. This method doubles the number of vertical lines drawn on the screen, reducing the refresh rate by a half. This way only one-half of the information is refreshed during each vertical sweep, or field. Two vertical sweeps (known as a frame) are needed to present all the information (see Figure 2). So, if the vertical sweep is 60 Hz and two sweeps are needed to complete a frame, then each frame is refreshed at 30 Hz. The method is used in standard United States broadcast televisions.

Due to the video characteristics of broadcast television, the low refresh rate of 30 Hz is acceptable. In a computer monitor this low refresh rate of 30 Hz is a problem, and flicker can result unless a long persistance monitor is used. Most computer monitors use the noninterlaced scan method with 60-Hz refresh rate, which means all the information is presented in one vertical sweep. The refresh rate is therefore the same as the vertical sweep, and the happy result is a flicker-free monitor.

Now that you understand the scanning mechanism, you may wonder how that data is actually displayed. This is accomplished with a feature of the CRT known as the control grid and cathode. When combined, the control grid and cathode constitute an electrical valve that controls the beam intensity. As the beam is being painted on the screen, the intensity can be controlled via the cathode and the control grid to display data instead of the raster scan lines.

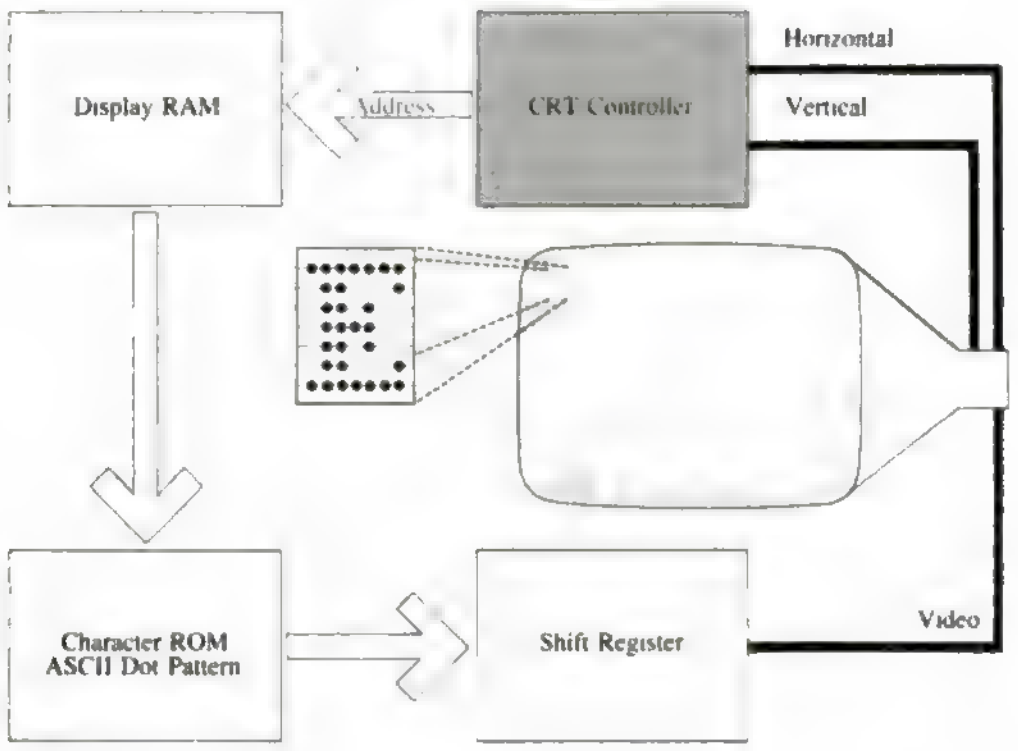

Figure 3: *The main components that are required to display information on a monitor are a sync generator and an address counter (CRT controller), a display RAM for video data storage, a character ROM, which converts ASCII to dot patterns, and a shift register, which converts the parallel dot pattern to serial data known a video.*

In order for the information to be displayed, certain components are required. A typical monitor interface consists of a sync generator, an address generator, a display RAM, a character generator read-only memory (ROM), and a shift register (see Figure 3).

Remember that the raster scan monitor generates a continuous raster pattern, so it's up to the interface circuitry to synchronize to both the horizontal and vertical drives. The sync generator basically has the responsibility to provide sync pulses at the correct frequency. Once synchronization is achieved, the video input connected to the cathode can be turned on or off to display dot patterns.

Usually a microprocessor generates the ASCII characters and stores them in display RAM. An address counter then fetches this data at the painting rate and

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presents it to a character generator. These characters are converted to a bit pattern by the character generator ROM. This pattern is then loaded into a shift register and synchronously presented to the video input of the monitor. The character generator ROM can be programmed with any character set, special symbols, or even mosaic graphic patterns.

Additional bits can be appended to each ASCII character to provide special visual effects. These bits can provide screen attributes such as reverse video, blink intensity, and color. Reverse video inverts the video and displays a black dot on a white background instead of the normal white dot on a black background. The blink attribute turns a field on and off at a certain rate. The intensity attribute, also known as bold, increases the beam current, making the field brighter. For color, three bits are

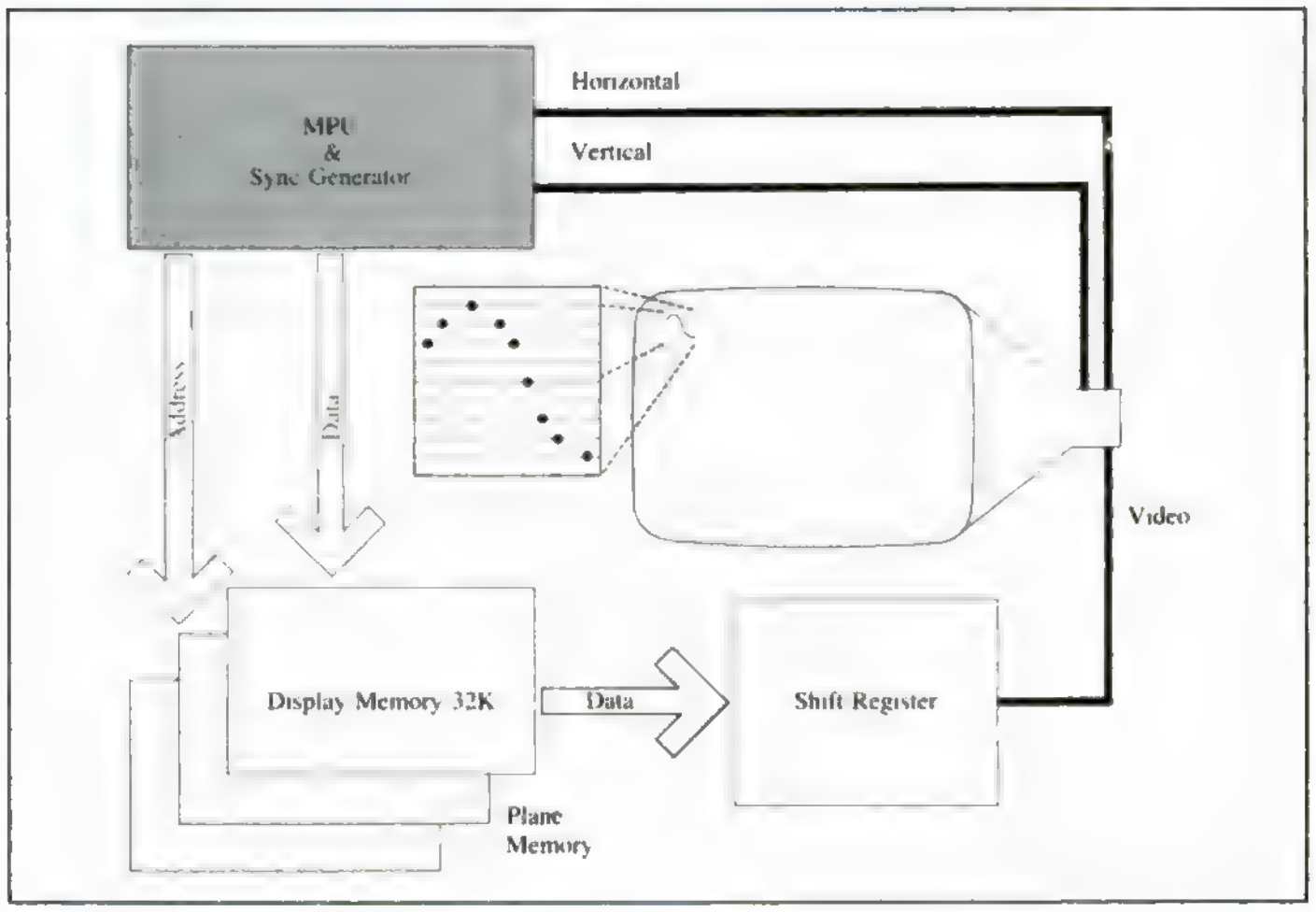

Figure 4: *A diagram of the bit-mapped system.*

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needed. Each one controls the video going to the red, green, and blue electron guns, respectively.

Bit-Mapped Memory

Raster scan graphic monitors usually employ a bit-mapped memory to store graphics information (see Figure 4). In a bit-mapped system, there is a bit-to-pixel relationship. The displayed information is a mirror image of display RAM.

Every bit that is high in RAM corresponds to an illuminated dot on the screen. In a monitor the information in RAM is only a code representation of what is displayed on the screen. For example, an 80 by 25 monitor requires only 2K bytes of display RAM. A typical bit-mapped system, an equivalent display may require 32K. As a result, whenever the total screen image has to be altered, 16 times more RAM locations have to be changed. A color graphics bit-mapped system increases the memory requirement even more. A seven-color system would require three bit-mapped planes, each plane consisting of 32K bytes.

Color CRT's

There are two major types of technologies used in color monitors: beam penetration and shadow mask. Beam penetration monitors consist of a single electron gun in which the electron beam is voltage-controlled to penetrate a series of superimposed phosphor layers. (see Figure 5). If one phosphor layer is red and another on top of it is green, the energy of the electron beam can be controlled to penetrate one or both layers. Low-beam energy levels penetrate the inner red layer phosphor, but when the energy is increased, the beam penetrates to the outer green phosphor layer. An intermediate energy level will provide a combinational yellow color. The penetration difference between layers is in the order of 4 kilovolts per layer. Although limited to a few colors, beam penetration monitors are more durable than shadow mask monitors.

Shadow mask monitors have three electron guns. A very common arrangement for these guns are in a triangle—known as a delta configuration. The beams generated from these guns must be precisely aligned and focused in order for the beam to pass through the perforated sheet metal, known as the shadow mask. The beam converges at the hole of the mask and proceeds to strike the red, green, and blue delta-phosphor-dot-pattern coating on the inner side of the tube. Three primary colors allow the shadow mask monitors to generate an almost unlimited number of secondary colors. This flexibility makes shadow mask technology applicable to broadcast and industrial fields and to PCs for color graphics monitors.

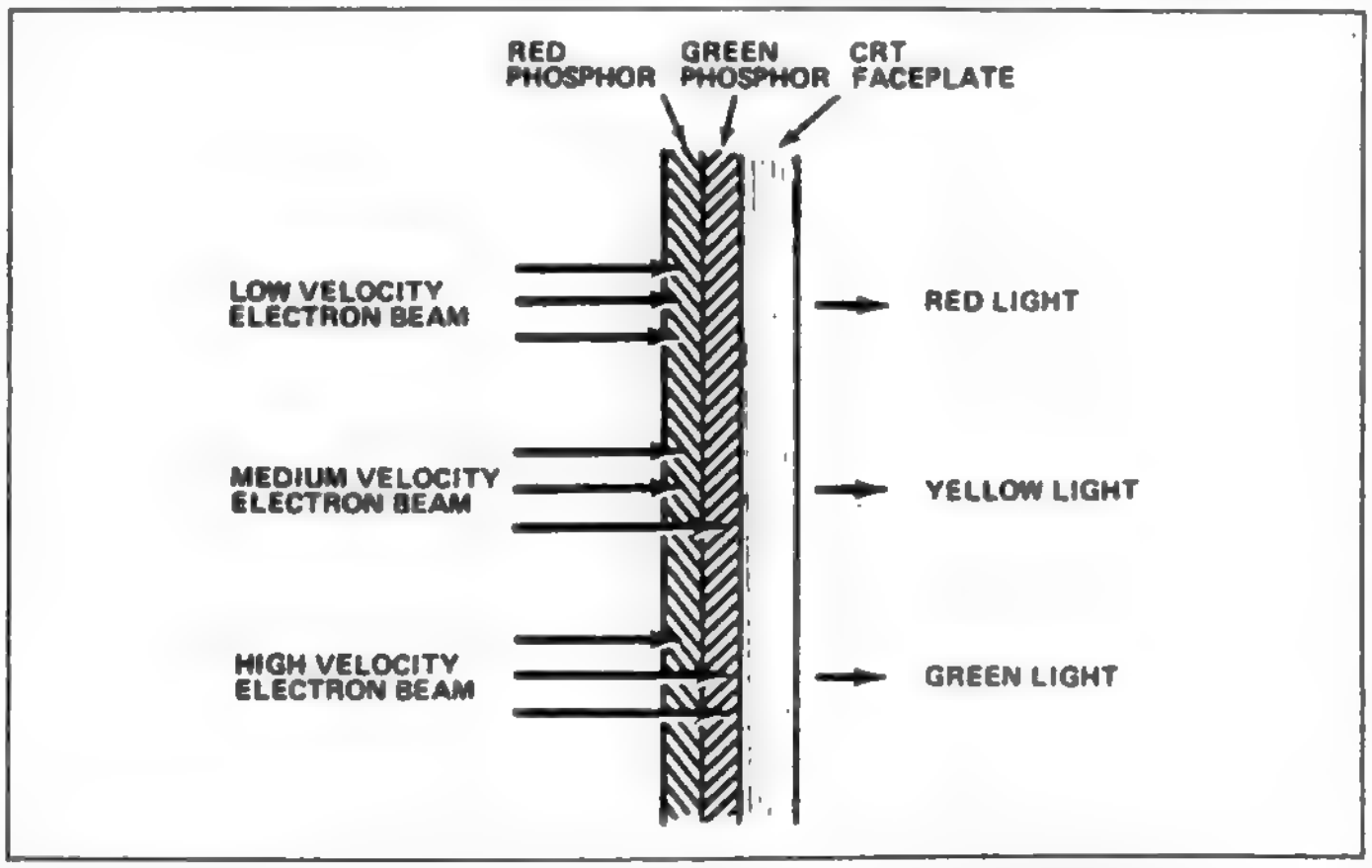

Figure 5: *Phosphor layers on the surface of a three-color beam penetration CRT. Acceleration of electron beam determines color output.*

Graphics Monitors

Certain considerations must be mentioned when discussing color graphics terminals, namely, resolution, graphics generation speed (pixel manipulation speed), and number of colors. These factors dictate the type of monitors to use. A shadow mask, raster scan monitor is a good choice.

Resolution in a shadow mask monitor is achieved through hole spacing (which is also known as pitch). A high-resolution color monitor may have in the area of 1,024 by 1,024 pixels. Pixel manipulation speed is a function whether the graphic generation is done in hardware or software. Currently, high-end graphic terminals use hardware such as bipolar processors to generate graphic images. Although this solution provides fast pixel manipulation, it is costly and requires a large number of devices to implement.

Another solution is to use a general-purpose NMOS processor and complicated software. Due to the mathematical modeling and calculation required to generate points, pixel manipulation is relatively slow. The last factor is the number of colors a monitor has to offer. The number of colors dictates the memory size. If there are three bit-mapped planes, then seven colors can be generated at once.

The majority of color graphic monitors use shadow mask raster scan monitors and are mostly software rather than hardware controlled. A major barrier to their proliferation—high cost—will change as the cost of memory drops. When this happens, color graphics will become established as a standard in the personal computer field. ■

Vincent N. Rende is Senior Applications Engineer at Standard Microsystems Corporation, in Hauppauge, New York.

It's 10 PM: Do You Know Where Your Data Are?

As microcomputer use expands, PC owners are becoming more concerned about data security. If you have files you want to protect, the science of cryptography can help.

Thirty-five years ago, when George Orwell wrote *1984*, he envisioned an age in which technology became so powerful that individual privacy would be impossible.

Well, 1984 is here, and the master machines Orwell foresaw as the tools used by Big Brother to strip individuals of privacy are certainly in existence.

Yet the world that has been shaped by such technological marvels is considerably more tolerable than the one Orwell foresaw. Perhaps to some degree we are unaware of Big Brother's pervasive influence in our lives, but most of us would agree that, in fact, *1984* has not come to pass. Still, as microcomputer users, there is an area for concern: data security.

In government agencies and corporate offices, some of Orwell's prophecies for 1984 have, indeed, come true. Computer technology creates unparalleled opportunities for spies and thieves. Corporate security experts, for example, find that their vulnerability to sophisticated spying techniques has increased as sensitive data has become much more accessible. One potentially dangerous possibility is the transferal and storage of proprietary corporate information from the company's semi-secure minis and guarded mainframe computers to microcomputers.

Spy versus Spy

Not only are data and programs generally unprotected on the PC and other micros, they are actually designed for fast and flawless duplication. Because much of the data is stored on comparatively fragile floppy disks, employees are trained to make frequent backup copies of data. Even if backup disks are erased using commands such as the PC's DELete, it doesn't take a computer wizard to reconstruct supposedly erased data. If you tax your imagination you may come up with a number of ways to secure confidential information that is (or was) stored on a microcomputer.

A corporate spy can transfer information by having it copied onto a $2 floppy disk or by getting a printout and smuggling it out of the building. Sophisticated eavesdropping devices that will record keystrokes or intercept electronic impulses as they enter the RAM can be attached to personal computers and electronic type-

Keeping your PC's DataSafe

DataSafe is a software implementation of NBS' Data Encryption Standard algorithm.

DataSafe, from Trigram Systems in Pittsburgh, Pennsylvania, claims to guarantee the security of data on your PC. The program, which was originally marketed under the name DES-Crypt, is an implementation of the DES algorithm. It's main menu offers the following choices.

(E) ENCRYPT file(s)
(D) DECRYPT file(s)
(C) Make crypto. CHECKSUM
(V) VERIFY encryption
(K) Create HEX KEY
(L) LIST file(s)
(Z) DESTROY file(s)
(A) Data AUTHENTICATION
(H) HELP
(X) EXIT

DataSafe
This program is available from three manufacturers.
List Price: $150
Requires: 64K RAM, one disk drive.

CIRCLE 699 ON READER SERVICE CARD

Trigram Systems
3 Bayard Rd., #66
Pittsburgh, PA 15213
(412) 682-2192

CIRCLE 694 ON READER SERVICE CARD

Lifeboat Associates
1651 Third Ave.
New York, NY 10028
(212) 860-0300

CIRCLE 693 ON READER SERVICE CARD

IMSI
633 Fifth Ave.
San Rafael, CA 94901
(415) 454-7101

CIRCLE 692 ON READER SERVICE CARD

When you begin the program, *DataSafe* spends a few moments checking the integrity of its encryption algorithm.

Although the ability to encrypt and decrypt are its primary functions, the other options ensure that, once encrypted, a file can be retrieved and that the previously encrypted information has not been tampered with.

The Checksum and Authentication features, for example, allow you to make certain that no one has altered data on your file. Checksum is used to verify the accuracy of a copy of a text file or program. Robert Lucas, the program's author, describes the checksum as "just a large number that is dependent upon every byte in your file (in the proper order) plus your secret key." He warns that "each checksum is not unique . . . two files can have the same checksum. It is highly unlikely that a modified version of your original file will have the same checksum; the probability is about 1 in 18 billion billion."

DataSafe also has a Verify option, which tests an encrypted file byte-by-byte against the original unencrypted program. This option is used before you destroy your original unprotected data, so you can remain confident of being able to retrieve your data. *DataSafe*'s Destroy function, in addition to erasing the named file from memory, fills the space it occupied with zeros (nulls), which makes it impossible to reconstruct the file through disk memory salvaging operations.

The Create Hex Key feature allows users to quickly create a key based on the full 256 characters in the ASCII set. *DataSafe* actually offers two ways of developing a key. You can either enter a series of eight hexadecimal numbers—which become the key—or you can enter a phrase of up to 58 characters, which the program will convert into an 8-byte hexkey. If you don't have any eight-character hex numbers in mind, the Create Hex Key feature will provide you with a suitable, unique hex key.

Security is important, but it is also important to be able to generate keys quickly and easily and to be able to encrypt and decrypt rapidly. In this respect *DataSafe* excels. Creating the 58-bit key with *DataSafe* takes only a few seconds. Once created, you can encrypt a 16-kilobyte file in less than 24 seconds. Thus a 160K single-sided PC disk can be encrypted in 3 minutes. The decryption process takes the same amount of time.

In addition to being fast and menu-driven, *DataSafe* is compact. The program occupies only 16K on the disk, less than 5 percent of the capacity of a single double-sided IBM PC diskette.

The program is available for CP/M-86 and CP/M-80 as well as other MS-DOS systems. This allows you to encrypt a file, send it by modem to an associate, use another means to inform him of the encryption key. He could decode the data on his own computer.

One feature planned for a future release is an option to compress text as it is being encrypted.

A final note: Although *DataSafe* is a software implementation of the NBS encryption standards, it does not fulfill government standards for a DES implementation, because it does not include a hardware implementation of its encryption algorithm. To use the program, federal agencies must obtain a waiver of the NBS' hardware implementation requirement for DES. —T.K.

writers. Or, if a modem is hooked up to the targeted PC, the spy can call a computer off the premises and send a full disk of information in about half an hour, depending on the modem's speed. Indeed, in some situations, this would be the preferred method of transferal spying, since there is virtually no way to trace a transfer of information via telecommunication unless the communication was initiated at the computer off premises. In such a case, the telephone bill could be used to catch a thief!

There are, however, the more mundane problems of internal confidentiality. For instance, with corporate officers recording a company's finances on *VisiCalc*, *SuperCalc*, or Lotus' *1-2-3*, the problem of keeping this information secure and out of the hands of company gossips arises—a challenge nearly as great as avoiding the corporate spy.

Fortunately, there is a solution. The computer's power to digitally store information can be used to your advantage. You can protect your data through the ancient craft of cryptography, the science of scrambling text so that it is impossible to read unless you know the proper means of decoding the information. (Two software packages that use cryptography to secure data are available for the PC. For reviews, see the accompanying sidebars, "Keeping Your DataSafe" and "Locking Up with PC-Lock II.")

Although electric enciphering machines were first used just after World War I, it was not until the seventies that computers were seriously considered as a means of rapid and safe encryption of data. In the past decade the computer has become the most important tool of the cryptographer, providing the means for more secure methods of encryption and relieving the drudgery of the early encryption methods.

How Encryption Works

A simple example of encryption is Pig Latin, a perennial favorite among 9- to 14-year-olds. The phrase *personal computer* is composed of 17 characters, including the space between words. The rule is to move the first letter to the end of the word and add a vowel, usually the letter *a*. Thus, in Pig Latin, *personal computer* becomes *ersonalpa omputerca*.

Sir Francis Bacon devised a simple method of encryption, and although it has not lasted, it is reminiscent of the 0's and 1's that make up the computer's memory. He reduced the 26-character alphabet to a six-character system composed of various combinations of the letters *A* and *B*. Thus *A* is AAAAA, *B* is AAAAB, *C* is AAABA, *D* is AAABB, and so on. What Bacon's encryption algorithm lacked in sophistication it made up for in its ability to drive you to drink. For instance, the encrypted version, or cipher, for the word *bad* is aaaabaaaaaaaabb. You can imagine how difficult it would be to decipher this code, even if you knew the key.

A somewhat more sophisticated encryption technique can be used to store the phrase in the computer's memory or on a floppy or fixed disk. A phrase can be converted to numbers that have been assigned alphabetic values. For example, using the ASCII alphanumeric standard (see Figure 1), the decimal system equivalent of the letters *I B M* is 73 66 77. The same three letters, *I B M*, will appear as 49 42 4D when converted to the hexadecimal system. The character string *IBM Personal Computer* would be rendered in hexadecimal as 49424D1420506572736F6E616C20436F6D7075746572.

Even though this may at first look like a hexadecimal version of the national debt, chances are a cryptographer could break this code based on a knowledge of the frequency of the occurence of spaces, common characters (*r*, *s* and *e*), prefixes, and suffixes in the English language.

In more recent times, encryption techniques have become highly sophisticated, but the basic premise, scrambling a message according to a prearranged formula or algorithm, remains. In cryptography, an algorithm is a procedure for calculating the value of some quantity or for finding the solution to some mathematical problem that frequently involves repetition. Cryptographic algorithms are used to convert plaintext (unprotected text) to ciphertext (protected text) and, when called for, ciphertext to plaintext again. To someone without knowledge of the algorithm, ciphertext appears as gibberish.

Although some of the rules are fixed, all encryption algorithms must have variables so that the rules cannot be used to

ASCII value	Character	ASCII value	Character
064	@	095	—
065	A	096	'
066	B	097	a
067	C	098	b
068	D	099	c
069	E	100	d
070	F	101	e
071	G	102	f
072	H	103	g
073	I	104	h
074	J	105	i
075	K	106	j
076	L	107	k
077	M	108	l
078	N	109	m
079	O	110	n
080	P	111	o
081	Q	112	p
082	R	113	q
083	S	114	r
084	T	115	s
085	U	116	t
086	V	117	u
087	W	118	v
088	X	119	w
089	Y	120	x
090	Z	121	y
091	[	122	z
092	\	123	{
093	]	124	|
094	^	125	}

Figure 1: *A portion of the ASCII character code, from which the letters* I B M *were encrypted to 76 66 77.*

break the secret code. In fact, some modern encryption systems, such as the data encryption standard (DES), make the algorithm public, thus relying on the variable, called the encryption key, for security (see the sidebar, "Substitution, Permutation, and DES").

Modern encryption techniques call for mathematical operations to be performed thousands, and even millions of times on a given set of data. Typically, plaintext is broken up into consecutive data groups of a set of characters. Once a group has been established, it will be broken into subgroups, and a mathematical key will be used to lock the data into a form which can be decoded only through use of the exact same key. Provided the key is long enough, it is impossible to break the code using random number generation. A moderately secure key would require a length of 32 bits; that is, 2 to the 32nd power.

Locking Up with PC Lock II

PC Lock II may not be user-friendly, but that's what data security is all about.

PC Lock II is a data security software and hardware package for the PC developed by MPPi, Ltd., of Glenview, Illinois. In this program, which is aimed at the XT market, a portion of the encryption algorithm is loaded into read-only memory (ROM) on *PC Lock*'s security board. The half-length board fits into one of the slots in the PC.

PC Lock II uses a software security system that is based on the concept of a "Super User" who manages the security of files and decides who else may access the machine.

The program encrypts and decrypts files at rapid speeds and prevents access to the PC itself if the user does not know the proper "passkey" or have access to what is called the "Super User Disk," which allows him to alter the status of various system users.

The system is indeed capable of keeping out unauthorized personnel. *PC Lock* completely locked me out of my system until I reread the manual and discovered that the program's software had to be initialized before the hardware could be installed!

After I crossed this hurdle, the system decided that I was an unwelcome visitor and chose to ignore my commands. I called Mike Allan, the author of *PC Lock II*, and he suggested that my sudden change of status from Super User to Unwelcome Guest occurred because the system card I was using was accessing the same portion of memory as the Passkey program, which prevented the machine from asking me for my Super User passkey. Several multifunction cards may conflict with *PC Lock II*, Allan explained.

After this, *PC Lock II* worked as advertised. The program allows you to establish various levels of users and to decide which users may have access to particular programs and data. In addition, the Super User can change these access levels at any time. The program also allows the Super User to set or remove "softlocks" from programs so that data can be transferred to other PCs either with or without *PC Lock* boards.

The program offers one special feature that alone may make the $349 price tag a bargain. It provides a program that prevents you from accidentally reformatting your fixed disk on the XT with the FORMAT command.

On the negative side, the manual is confusing and doesn't fully explain the capabilities of the system. According to MPPi, the manual is presently being revised to provide additional information. —T.K.

PC Lock II
MPPi, Ltd.
2200 Lehigh Ave.
Glenview, IL 60025
(312) 998-8401
List Price: $349 (including board).
Requires: 64K RAM, one disk drive.

CIRCLE 691 ON READER SERVICE CARD

Data Encryption Standard

Recognizing the need for the maintenance of privacy and for protecting information from tampering, the United States National Bureau of Standards (NBS) noted, "In the decade leading up to 1973, there has been an accelerating increase in the accumulations and communication of digital data by government, industry, and by other organizations in the private sector." At that time the government solicited proposals for cryptographic devices for the protection of computer data during transmission and dormant storage.

A few years ago the NBS adopted a Data Encryption Standard, which uses a sophisticated algorithm based on a 56-bit computer generated key and which was designed to be used on government computer systems.

The adoption of DES has been the subject of considerable controversy in the cryptographic community. Some experts maintain that placing any information about the encryption technique in the public domain gives the opponent the advantage in an attempt to break your encryption system. However, since the NBS standard was adopted, no one has come forward claiming to have the ability to crack DES.

As Robert Lucas, the author of the encryption program *DataSafe*, explained in his well-written program manual, "DES has been subject to more public scrutiny than most other cryptographic systems, and . . . more than 5 years of work has not resulted in any cryptanalytic techniques that significantly challenge the security of DES." The counterargument is

that the ability to crack the standard is more valuable as a secret than as a public announcement, and the party with the most incentive to break the security of DES is the least likely to announce its victory.

However, most people who use the standard would agree that if the length of DES' encryption key were set at around 200 bits (2 to the 200th power) instead of the current 56, the chances of ever breaking the code would become nil. One analyst estimated that the possible combinations of a 200-character key exceed the number of atoms in the known universe.

But for PC users the DES algorithm, or any similar computer encryption method, should provide enough security for even the most sensitive task.

In 1976, NBS sponsored a workshop on DES, composed of 20 representatives from industry, government, and universities. The committee determined that the 56-bit DES key should be secure until 1990 or beyond and that a computer capable of exhausting all the possible keys in the system would cost tens of millions of dollars.

So, if you use a data encryption program with your PC, you don't have to worry about your data being decoded. A greater danger lies in losing the key used to decipher encrypted information. This would mean that no one could ever recover the data. And a lost key is even worse than having no security at all. ■

Substitution, Permutation, and DES

A sample sentence is ciphered and deciphered according to the rules of the DES.

By its very nature, encryption is a complex process. The advent of computerized mathematics has added a new level of complexity to the art. Still, you can learn about encryption processes if you understand two basic principles of cryptography: substitution and permutation.

Substitution is the process of replacing one character with another character each time it occurs in the text. For example, if this sample sentence is changed to have every *e* become a *u* and every *s* an *x*, it will look like:

For uxamplu, if thix xuntuncu ix changud to havu uvury u bucomu a u und uvury x a x, it will look liku:

Although it is possible to get the gist of this statement, you can see how nonsensical it could become if extra characters were used. In a full-blown cryptographic sentence, every character would be substituted for another character.

But even with this meager two-character substitution, you can make things quite confusing by introducing the element of permutation, the rearrangement of characters according to a formula. For example, you could use the sample sentence encrypted with character substitutions and break it up into blocks of six characters each, with a hyphen between each group of six. It will then appear like this:

For ux-amplu,- if th-ix xu -ntuncu- ix ch-angud -to hav-u uvur-y u buc-omu a- u u n-d uvu -ry x a- x, it- will -look l-iku:

Well, it certainly isn't getting any easier.

Now you can really put permutation to work by exchanging the sixth character with the first character in each group of six characters. The sample sentence will look like this.

xor uF-,mplua-hif t - x xui-utuncn-hix c - nguda-vo hat-r uvuu-c u buy-amu o-nu u - uvud-ay x r-tx, i - will -look l-iku:

Now, about all you know for sure is that you have English here. For good measure, do another permutation. Reverse the third and fourth characters of the six-character blocks, and, while you are at it, remove those tacky hyphens. Now the sentence reads like this:

xo ruF,mlpuahi ft xx uiutnucnhi xc nugdavoh atr vuuuc b uuyam u omnu vuudayx rtx ,i wlil loko lik:u

Only a cryptographer could love a sentence like this one.

However, the techniques of permutation and substitution could be reversed quite easily, and the plaintext can be recovered from the ciphertext. The letter *e* can be resubstituted for *u* and *s* for *x*. The first and sixth characters of the arbitrary blocks could be reversed to their original positions, as could the permutation of the third and fourth positions.

Although the DES algorithm is much more complex than the sample sentence given here, the principles of permutation and substitution are the most important operations used to scramble plaintext into ciphertext. In DES, the content of the key determines the rules of substitution and permutation. The length of the key, 56 bits, makes it difficult to crack the code even if you apply force, which, in this case, means trying every possible substitution and permutation. The combination of these mathematically sound rules and a key with literally billions of combinations makes DES what it is today—the closest thing available to a fail-safe encryption system. —T.K.

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CIRCLE 204 ON READER SERVICE CARD

What's Next From IBM?

IBM does its best to keep its plans to itself, but Will Fastie ventures a guess and speculates about a hypothetical new machine on Big Blue's horizon: the PC^2.

Thank goodness I don't earn my living predicting what IBM will do next. Do you have any idea just how hard it is to find out what IBM is up to? In the first place, the company has a policy, which it ingrains in every employee, not to discuss any possible future product or service of, by, or from IBM. A week before the PC*jr* was announced, I asked an IBM staffer, who must have been aware of the product, about the so-called Peanut. The response I got: "What's a Peanut?"

IBM also has the clamps tightened on its suppliers. Based on the little I know about IBM's nondisclosure agreements, a company working with IBM cannot even reveal that such an agreement is in force.

Playing the IBM game can be entertaining: One week, a company representative will talk freely to you, and the next week, won't say a word. If the conversation is in person, you can watch the tension build; this behavior itself is revealing. If you know a lot about the firm's business, you can sometimes deduce what they are up to.

The Coca-Cola Effect

The other main obstacle to penetrating IBM's wall of silence is what I call "the Coca-Cola effect." Coke keeps the secret of its formula safe in the hands of a small group of people. But what about spies? Couldn't they watch deliveries and analyze the plant's waste? Perhaps Coke protects its formula by buying supplies that it doesn't actually use. It could buy an incorrect ratio of supplies and pour the confusing excess down the drain. IBM may be even better at this ruse than Coke is.

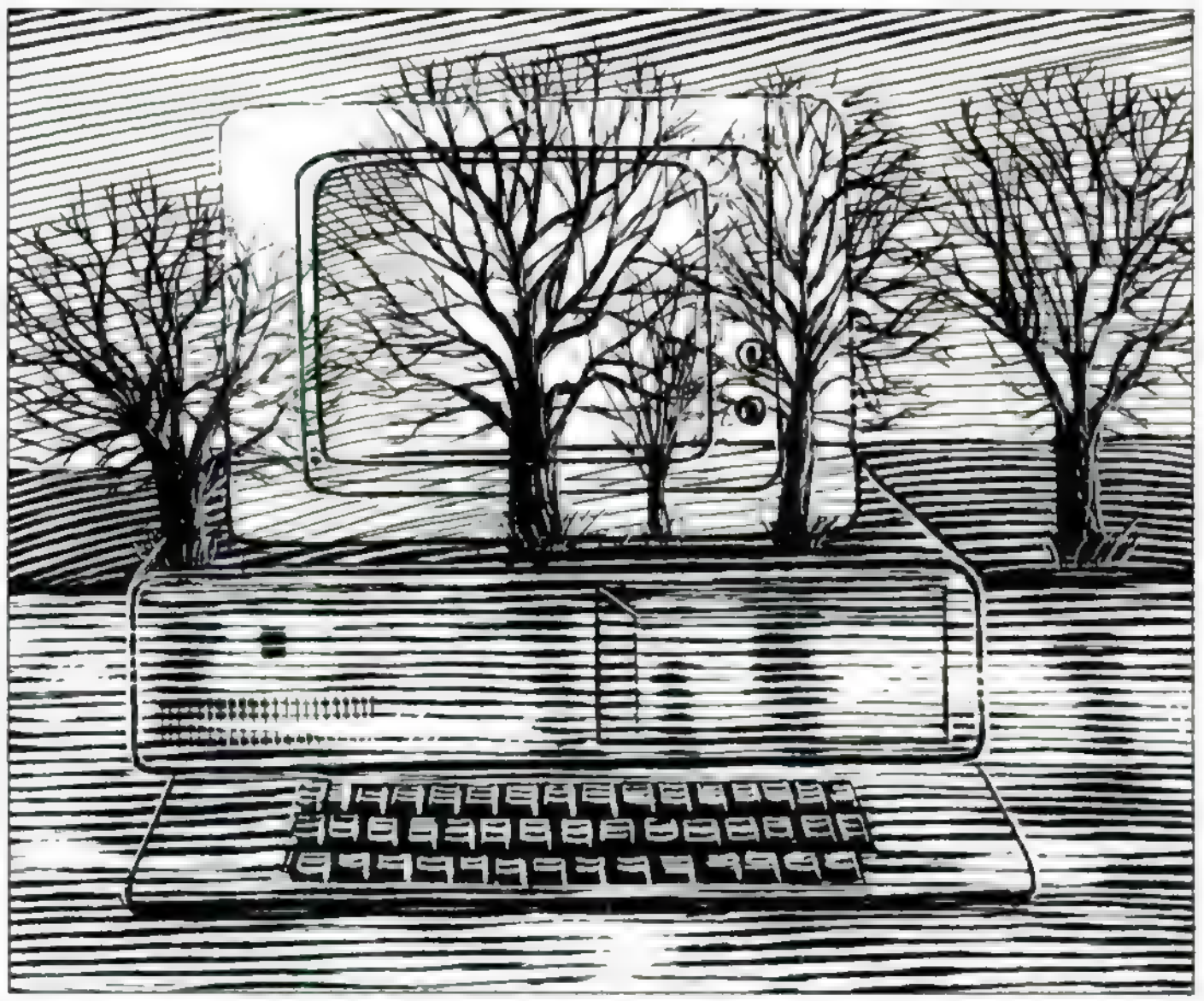

Illustration: Marc Taffet

IBM is a gigantic company with activities and interests in many areas. What does an activity in Boca Raton really mean? It could just as easily signify new products from the National Accounts Division. What about when IBM buys interests in Intel and Rolm? Forget it. It's the Coke effect.

Try this one on for size: in March, 1981, what was the prevailing opinion about the future of personal computers and the companies that would dominate the market? That was 6 months before the PC was announced, and Apple looked like the

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CIRCLE 347 ON READER SERVICE CARD

king of the heap. There were no clues to the dramatic changes ahead.

To describe the work of an IBM watcher as unrewarding is a true understatement. Nevertheless, it can be fun. Yes, that's right, *fun*. Just think: Suppose I make a guess and hit it on the nose? Shades of Karnac the Magnificent!

Now that you know how difficult it is to extract any information from IBM, you can appreciate the difficulty of making the predictions that follow.

So What's Next, Anyway?

Now that the PC*jr* is out of the way, IBM may be turning its attention to the next edition of the PC, which I will call PC^2 for lack of anything better. Given the competition, it's about time for IBM to make a move.

The competition comes from the manufacturers of the so-called compatibles and other MS-DOS-based systems. There are many PC variations now on the market that offer considerably higher performance than the current PC. This raw processor power is becoming critical as software vendors try to get more and more out of the machines, especially in the areas of graphics, multitask windowing, and small multiuser systems.

The new machines use the 16-bit 8086 or 80186 microprocessors and have clock rates as high as 8 MHz. This, combined with a wider data path to memory, gives them raw CPU performance that is two to three times higher than that of the PC.

Although the PC performs more than adequately for most applications, we are turning a corner in the software industry and requirements are changing rapidly. Microsoft's *Windows* and VisiCorp's *VisiOn* represent just the tip of the iceberg of new systems and applications, none of which are practical on 8-bit machines, including the PC. Many of these applications require hardware resources well beyond anything currently offered in a mass-produced desktop computer. Other important considerations in matching hardware to these new software packages include main memory and mass storage.

Memory and Storage

A memory-based program can be very fast. But to work so quickly, most of the program must reside in memory. At the moment, few applications require more than 256K RAM, but I predict pressure to increase that amount will increase.

IBM may be turning its attention to the next edition of the PC.

Some computationally intensive programs also require large amounts of main memory to store data. This is often the case with engineering, scientific, and statistical applications. Often such a program is not feasible even if the data is stored on disk, because of the number of computations that need to be performed. Nonetheless, the use of a desktop computer is still compelling, even if the work takes longer. The large number-crunching mainframes do not offer a reasonable alternative because of the high costs.

The need for data storage is also increasing. Even a modest data set usually will not fit on a typical diskette, and larger sets are well beyond the capacity of the typical 5- or 10-megabyte hard disk. Hard disk subsystems for the PC in the 200- to 400-megabyte range are already selling well, especially to scientists.

The data requirements in science are particularly severe. A relatively simple experiment can yield torrents of data, usually in numeric form, which must be examined, reduced, analyzed, or otherwise manipulated. Often the researcher is looking for patterns and trends, a tedious task ideally suited for computers. The data collected can not often be segmented, making large storage devices necessary.

In commerce, I believe we'll see a trend to move information out of the central DP/MIS departments and back into the user departments. Before computers, information was kept by the people who understood and used the data themselves. These same people were responsible for the accuracy of the information. Today, a gap has grown between the people responsible for the accuracy and use of the data and the computers that actually keep it. A desktop computer with adequate storage and appropriate links to the central MIS facility could live on the desk of the very clerk who understands and needs the information—a definite improvement.

IBM will soon have to respond to the pressure, and the rumors would seem to bear me out. A PC^2 with the Intel 286 processor and a hard disk subsystem with up to 100-megabyte capacity would be one logical response. Main memory would start at 256K RAM and might even come in increments of 256K, if the machine uses the new 256K chips. A machine with 1-megabyte capacity and a 4-megabyte virtual memory space seems about right for the kind of tasks at hand.

Pretty Pictures

Improved graphics capabilities are another important piece of the PC^2 puzzle. I'm hoping that IBM will introduce a new standard that will provide existing PC/PC*jr* capability, high-resolution graphics (at least 400-by-720), and 16 colors from a larger palette. This would display text as well as today's monochrome monitors do and would handle 44 lines of 100 characters. Furthermore these displays would provide the graphics capability necessary to handle windows, graphing, and even some snazzy drawing.

If this PC of the future reminds you of Apple's Lisa, well, except for the faster processor and the vastly increased mass storage, you're quite right. In fact, it's a pretty fair description of the expensive Xerox Star, except that the Star itself has no computational capability.

There's only one problem: The PC^2 looks like it might turn out to be a $15,000 machine. My threshold of pain is $9,995. What's yours? ■

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The Tiào Of Killing Aliens

PC Arcade presents a frantic space battle against unidentified alien birds and spaceships in Czorian Siege and a cool battle of wits with ancient Chinese gods and goddesses in Tiào Ch'i.

You could call *Czorian Siege* "Timothy Leary Goes to the Shooting Gallery." Or maybe, "Monty Python Plays Space Invaders."

Whatever, just when you thought it was safe to venture into space again, here comes a shoot-'em-up with a demented edge. This game, a bit rough around the edges and with no redeeming social value whatsoever, does show a few of the hallmarks of a fertile mind, and perhaps a tuneful ear as well.

To begin with, it's one of the most talkative shoot-'em-ups ever to arrive in the PC Arcade. At the beginning, the game announces its presence via the PC's speaker by declaring in ringing tones that would make the herald Stentor proud: "Czorian Siege!" And if the voice catches you by surprise and you end up staring numbly at the screen for a few seconds trying to think of what to do next, a more pleading and younger voice implores, "Come on. Give us a try."

The game it self is an acid freak's vision of *Space Invaders*, with fluttering birds and stuttering spaceships cruising randomly back and forth and up and down in a framed shooting gallery. You can fire at will, but in some of the early rounds you've got to time your shots carefully so they pass through moving windows of opportunity. In the beginning of the game the birds, which look like mutated ostriches, drop lethal eggs straight down. Later on they hurl them at your gunner at angles. And, if that's not enough, in the upper reaches of Czoriandom a demented boomerang chases your gunner across the bottom of the screen, emitting a wah-wah warble that somehow seems just right.

Minimal Brain Involvement

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keyboard or with a joystick, and versions for both the color/graphics and the monochrome board are provided. I found the keyboard version faster and more responsive. Interestingly, the configuration menu at the start of the game allows you to select positional or directional control in the joystick mode. Under directional control the gunner at the bottom of the screen moves in the direction you push the joystick, just as in most games of this type. Under positional control, however, the gunner scurries to and holds a position based on the deflection of the joystick (left or right from dead center). For example, if you hold the joystick 20 degrees left of center, the gunner moves to, and stops at, a certain point on the left side of the screen. Instead of merely moving in the direction the joystick is pointing, the gunner goes to the particular spot the joystick indicates. You indicate places, not directions.

Just when you thought it was safe to venture into space again, here comes a shoot-'em-up with a demented edge.

There are 10 levels to the game, which you select at the start from the configuration menu. At level 0 the game is slow and easy to play; at level 9 it becomes an insane exercise for the wrist and thumb but requires only minimal brain involvement. Somewhere around level 5 seems a plausible starting point for beginners.

One other fillip to this game is its, "Look out, it's the boss," button. Punching the F9 key blanks out the screen and shuts off the noise in midplay. The screen remains blank until His Nibs is out of the way. Then you just tap the F10 key and start killing aliens again.

Which brings me back to the point of this review: It should be obvious by now that this game is a few baby steps beyond the ordinary, and its authors should be commended. But it's ultimately just another "Kill the Aliens" game. Isn't anyone out there working on a test of mental and physical responses that doesn't involve a loaded laser beam and an unfriendly (and unexplained) life form from beyond our troubled orb?

ON *PC Magazine*'s game rating scale, from a low of one to a high of 18, *Czorian Siege* blasts out a respectable score, with extra emphasis on sound effects:

FUN:	4
CHALLENGE:	4
GRAPHICS/SOUND:	5
TOTAL:	13

Tiào Ch'i
MicroClassics
315 W. Grand Ave.
El Segundo, CA 90245
List Price: $24.95
Requires: 64K RAM, one disk drive, color/graphics or monochrome adapter.

CIRCLE 538 ON READER SERVICE CARD

At last a computerized version of an old-fashioned classic. A very old-fashioned and venerable classic. As a matter of fact, it's quite probably one of the all-time oldies: *Tiào Ch'i*, known to most of us as Chinese Checkers.

This program is a very well-thought-out evocation of the traditional game, one that makes sense as a computer game. *Tiào Ch'i* uses the grahics ability of the PC with great skill and employs the machine's computational power to provide a most honorable opponent.

At boot-up, the player is greeted with a repeating melody of Oriental origin and a set of menus for selecting the level of play, the number of players, and either pictograms or numbers to represent your marbles. The game can be played on a color screen driven by the color/graphics adapt-

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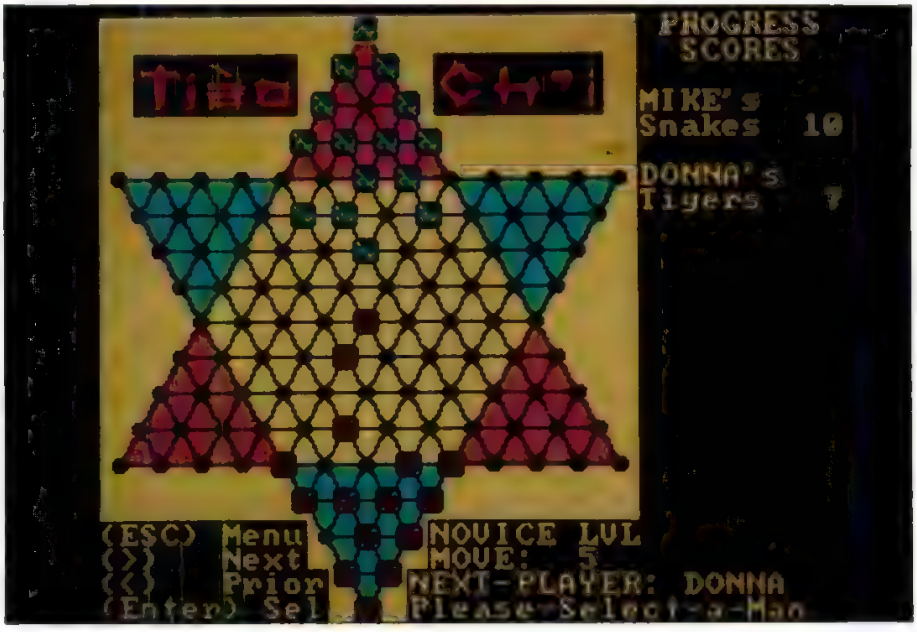
er or on a monochrome screen using ASCII characters.

In the color/graphics version, the player has a choice of one of twelve tokens, representing each of the Chinese years: Rabbit, Horse, Sheep, Dog, Rooster, Ox, Monkey, Rat, Snake, Dragon, Tiger, and Boar. Each token is a colored silhouette against a black background, and the token's color matches the color of the goal. For monochrome games, or for games on a low-resolution color television screen, using numbers for tokens is more appropriate.

Chinese checkers is played on a six-pointed star. Players attempt to move all the markers in their own triangles to the triangles directly opposite them. Moves are divided into hops in any of six directions. Hops can be over a single friendly or opposing marker, or can be a series of



A *Tiào Ch'i* screen as a two player novice-level game is about to begin.

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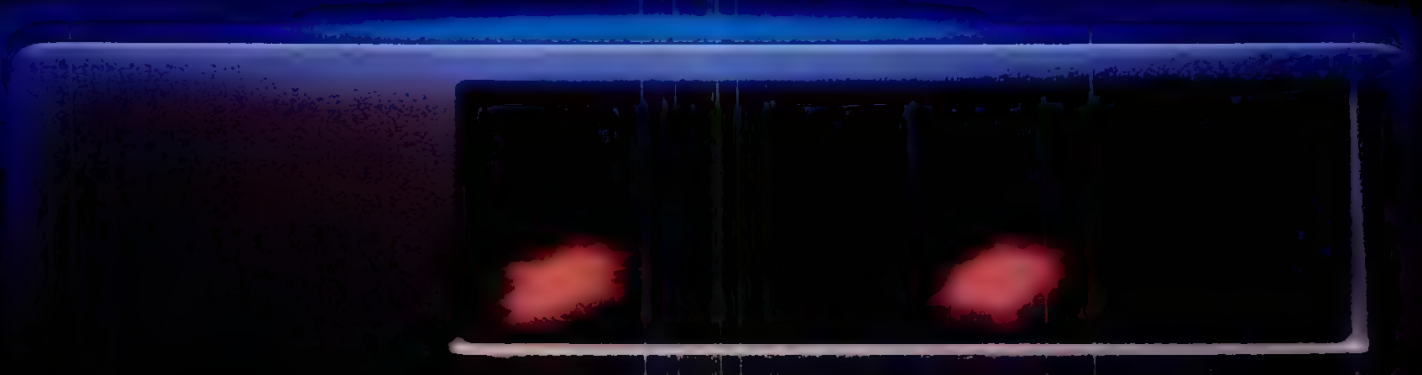

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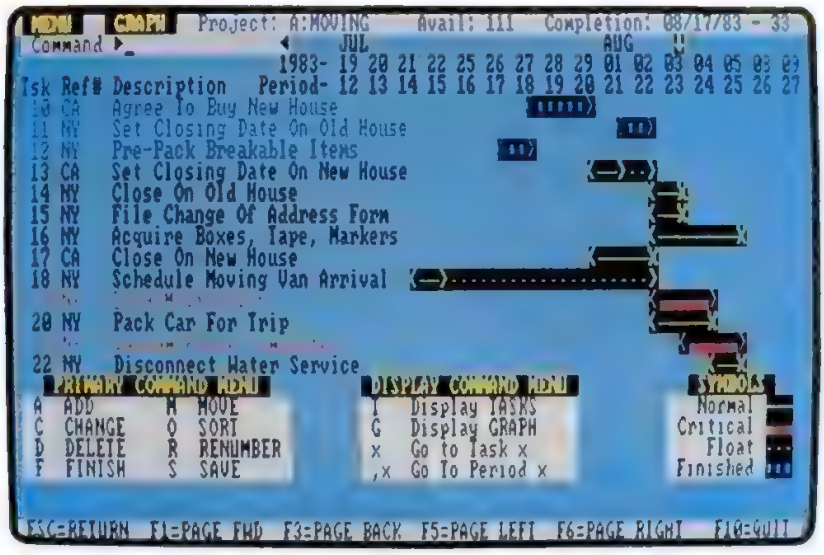

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jumps over the top of several pieces, just as in regular checkers. Defensive blocking moves are an important element of the

Tiào Ch'i uses the graphics ability of the PC with great skill.

game as well, although it is improper to refuse to budge from an occupied space when your opponent is ready to win.

There is a choice of three levels: novice, expert and master. A master game played against a computer opponent could take as long as 4 minutes between moves. The novice level is very quick.

Moves are made through the use of just three keys—the less than and greater than signs (<), (>) and the Return key. After you choose which token you wish to move, the program moves it for you. If you don't like the program's choice, you can override the computer's selection and make any legal move you desire.

If you opt for the computer as an opponent, the program assigns a mythical player for you to compete against. (Mine was introduced to me as Lei Kung, God of Thunder, and was a heck of a fine *Tiào Ch'i*-ist). In fact, you can select as many computer opponents as you'd like. In one game, I pitted six computer foes against one another. In case you're interested, Heng-O, Goddess of Moon, was the winner in 34 moves. I looked on as she snookered Kuan Yin, Goddess of Mercy, into setting up a beautiful five-hop dogleg with a twist in the end game.

A lovely piece of work, with no violence and much exercise of the brain—I will recommend *Tiào Ch'i* highly once I figure out how to pronounce the name.

On PC's scale from one to six, *Tiào Ch'i* rates:

FUN:	4
CHALLENGE:	5.5
GRAPHICS/SOUND:	5
TOTAL:	14.5

■

Getting Your Feet Wet

David Cortesi's book gently introduces beginners to the PC and BASIC. Brief Reviews introduces a new series about computers in teaching and a compendium of high-tech trivia.

Remember nervously opening the boxes that contained your expensive micro, peeling the plastic off the thick manuals, and skimming through their intimidating pages, thinking, "What did I get myself into?" Like all newcomers to the mystical world of the PC you probably needed some moral support and some hand-holding. *Your IBM Personal Computer* by David Cortesi is just the book to provide that support.

Cortesi has written, in plain English, an extremely readable introductory guide to the PC. His book will be most helpful to people who know little more about computers than that they'd probably find one useful. It is also aimed at those who are about to uncrate a PC and don't know where to begin this awesome experience.

Cortesi's use of everyday analogies makes the book easy to understand. For example, did you ever think of your computer system as a fancy restaurant? Cortesi did. And although the image seems strange at first, you may think of it the same way after you've read this book.

Your IBM Personal Computer: Use, Applications, and BASIC
David E. Cortesi
(Holt, Rinehart and Winston, New York)
253 pages; softcover; $17.00

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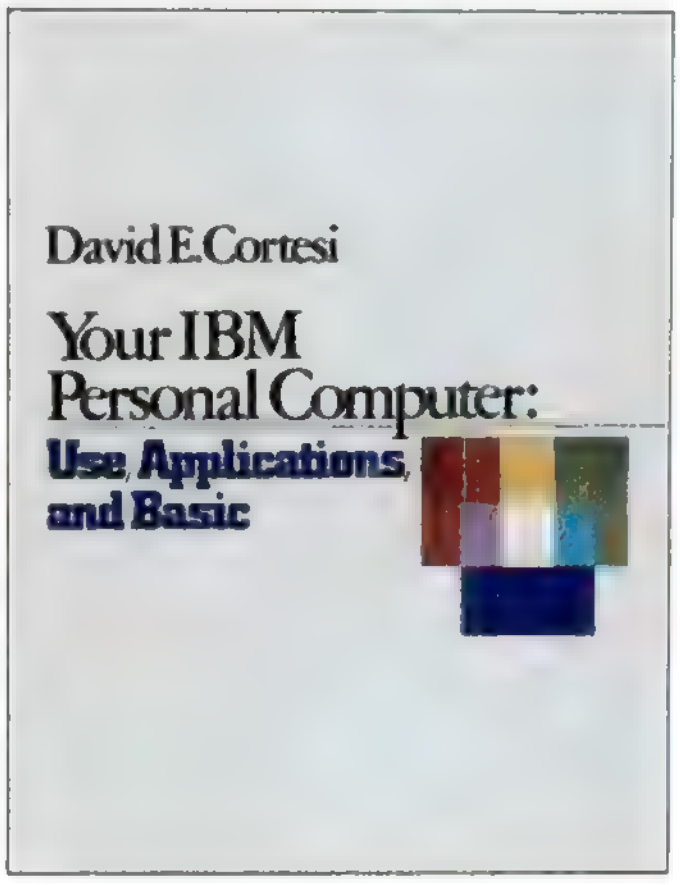

Cortesi sees hardware as the restaurant building itself, along with the silverware, kitchen equipment, and furniture. Software represents the staff, with operating system programs serving as cooks who work in the kitchen, out of view. Where do those "cooks" locate ingredients? In the pantries, or diskettes. And with these ingredients they prepare the meals, or files, as ordered. Your other programs are the waiters who present menus and carry things between the hungry user and the operating system chefs. The analogy may be farfetched, but Cortesi makes it work to guide you through your initiation into the PC.

Companion and Guide

In fact, Cortesi characterizes his book as "a companion and a guide" and assumes that you've never used a personal computer before. The emphasis, therefore, is on practical operations, not technical jargon. The psychological thrust is best described by the title of the first chapter, "Encouragements." The book helps readers feel that they, not the machines, are in control. It doesn't contain all the answers or even most of them, but it will lead you to the points where you can and should read further—in the DOS and BASIC manuals or other publications. You can check the book's bibliography for suggested further reading.

Starting with selecting a system and preparing a comfortable workplace, *Your IBM Personal Computer* takes you through setting up your hardware, including the printer. It introduces you to the keyboard and to DOS, and poses some of the questions you may not even know you need to ask. For instance, how many outlets will your system need? What's the best height for your printer so the paper won't tear as it feeds? How far should your monitor be from your face to avoid eyestrain? What's the difference between an internal and an external command? What's a default drive? A more experienced user may wrongly assume that everyone knows the answers, but many

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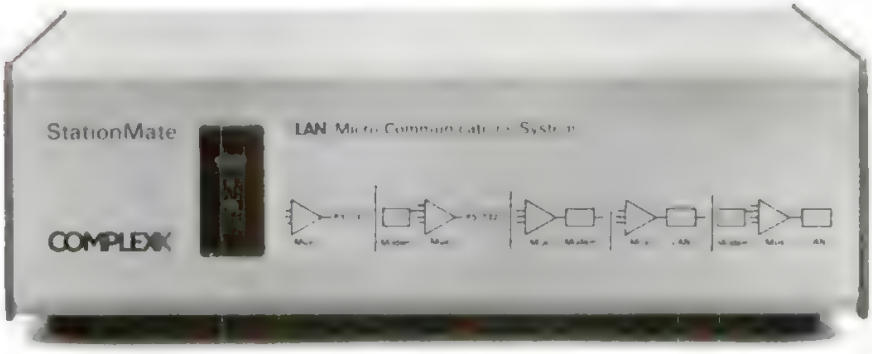

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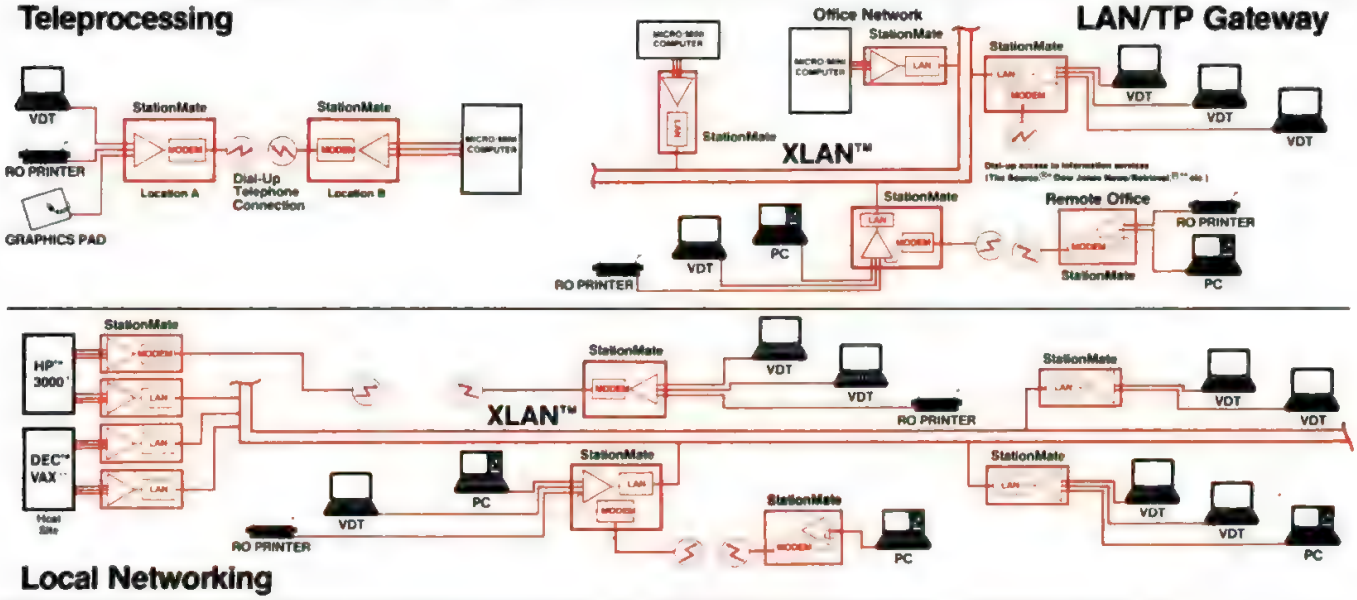

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newcomers to the PC certainly don't.

Cortesi has sound advice on how to set up your own diskette library, how to deal with retailers and mail order firms, and the importance of making copies of your diskettes. He explains how software is made while counseling on how to shop for, evaluate, and buy applications programs. One chapter is a how-to lesson on exploring a new program. The book uses *VisiCalc* as an example, but if you have a different spreadsheet program or none at all, it is still a logical, step-by-step way to familiarize yourself with any software more complex than a zap-and-destroy game. Cortesi provides a good explanation of those warranties that seem to give software manufacturers all the rights while you get none, and why it's useful to mail back the software registration cards. There's a useful four-page glossary, and appendixes covering programming the IBM printer, installing circuit board options, configuring storage size, and switches.

Photographers can talk for hours about film and lenses, but the rest of us are only interested in looking at pictures.

Easing into BASIC

Cortesi has a unique attitude about programming. He describes it as a craft and believes that while the PC has great programming possibilities, they should be regarded as "optional study" for novice users. Instead of rushing into programming, as many are inclined to do, he suggests first getting a feel for your system and becoming familiar with DOS commands and with the software you've purchased. Only then, he says, should you approach BASIC.

Once you are ready, though, Cortesi eases you into BASIC programming as painlessly as I've ever seen. Don't feel intimidated by the technical end of programming, he advises: "An experienced programmer has a huge inventory of tricks and tools: standard methods of solving common problems, different programming languages, and so forth. These technical details are fascinating to people who work with them but completely boring to people who don't. It's a lot like photography: Photographers can talk for hours about film and lenses, but the rest of us are only interested in looking at pictures."

If you make the introductory journey into BASIC with Cortesi, don't expect to plunge in like an Olympic diver. Instead, the book's approach is gradual; you first get your toes wet, then your ankles and knees before you're waist- or chest-deep. You won't feel like you're drowning in a sea of string variables. For example, rather than assume that every reader already knows the meaning of the buzzword "program statement," Cortesi introduces the concept by outlining a human program to scratch your head.

This gentle introduction to BASIC covers entering and editing a program; saving, loading, and listing; and the concepts of loops and nesting. To illustrate various points, there are simple miniprograms that you can enter and run on your PCs as you read through the book. In the course of the four chapters on BASIC, the most frequent commands are covered, and Appendix A explains the 42 commands of "local" cassette BASIC. The rest of the section deals with character data and functions, direct mode execution, screen output, files, and arrays.

"It's easy to get in over your head when building a program, especially when you are a novice programmer," Cortesi observes. He recalls his first programming effort, a check register for his personal checking account. "That's an attractive idea, one that almost every new programmer thinks of," Cortesi continues. He then explains why his first effort didn't work "and wouldn't have been much use if it had." His approach—start small, make something very simple, make it work, and make it tidy—is demonstrated by the simple program to convert temperatures between Centigrade and Fahrenheit, which he includes in the book. After following development of the temperature conversion program, you won't be quite ready to write your own word processing program, but you will be familiar with BASIC and ready to move on if you wish.

That statement could be made about Cortesi's entire book. By the time you've worked your way through the unfamiliar parts, you won't be a computer jock but you'll know enough to regard your PC as a useful, versatile, and nonintimidating tool—only a machine but a fast and patient one. Most important, you'll know how to go about learning to use more of its potential. —**E.F.**

BRIEF REVIEWS

Computers and Reading Instruction
Leo D. Geoffrion and Olga P. Geoffrion
(Addison-Wesley, Reading, MA)
218 pages; softcover; $13.95

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Computers in Teaching Mathematics
Peter Kelman, et al
(Addison-Wesley, Reading, MA)
308 pages; softcover; $13.95

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This new series is aimed at teachers who want to begin using computers as educational aides. The texts cover various computer utilizations for primary and secondary grade levels and include descriptions of available software, examples and illustrative scenarios, and corresponding teaching techniques. The authors treat their respective subjects in an authoritative, clear manner. If teachers don't mind the occasional interpolation of editorial

comments, these volumes should serve them in good stead. —**Barbara Krasnoff**

Excerpts: *No increase in numbers of science and mathematics teachers, particularly if many of them are overnight converts from the "breadlines" of English teachers, can produce technologically literate high school graduates if the curriculum doesn't reflect this as a goal.*

The Naked Computer
Jack B. Rochester & John Gantz
(William Morrow & Co., Inc., New York, 1983)
335 pages; hardcover; $15.95

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According to the cover blurb, *The Naked Computer* contains "hundreds of . . . computer records, trivia, anecdotes, odd events, interesting personalities, and technological marvels of computerland past and present." That, at least, is true; this volume is absolutely crammed with as much information as anyone could possibly want having to do with computers. And if you know any trivia maniacs, this could be the perfect volume for them.

However, they might have a little trouble finding what they're looking for. Although the book is divided into chapters, the arrangement of items within the chapters seems totally arbitrary. There is no way of knowing why a particular story ended up where it did. In addition, much of the information seems like a collection of unrelated facts—or perhaps a collection of the authors' excess notes. —**B.K.**

Excerpts: *The Naked Computer's* favorite show. *It's the 1976 National Computer Conference in New York at which Data General displayed one of its computer chips in the navel of a belly dancer.*

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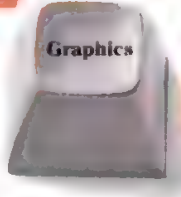

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A Tool For A Technical Writer

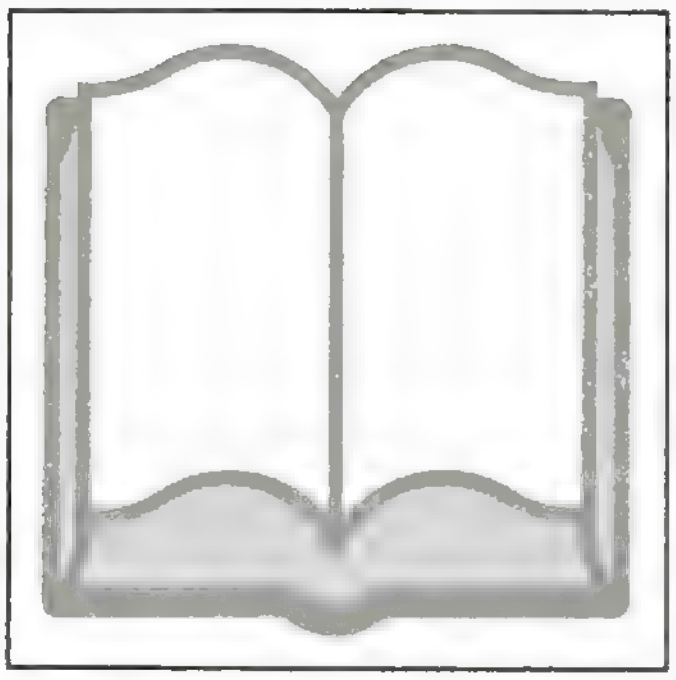
The use of the PC as the technical writer's premier tool of the trade obliges writers to configure their computer systems both for word processing and for product testing.

The microcomputer industry abounds with stories of programmers scraping together the price of a PC, then working nights and weekends to turn their ideas into code and their code into gold. This IBM alchemy has been discovered by another professional group—independent (or free-lance) technical writers, for whom the IBM Personal Computer is an ideal development tool.

There are two reasons why the PC is a valuable tool for technical writing. First, the plethora of hardware and software available for the PC makes setting up a technical writing system easy. Second, an enormous number of software packages are being written to run on the PC, all of which need professionally written documentation. But many of the companies producing PC software are small, and few of them have their own technical writing staffs. As a result, opportunities abound for independent technical writers, especially those with their own PCs.

Independent writers who produce manuals for PC products are often required to do the entire job: write the text, format it, and prepare the camera-ready pages.

What, more precisely, does a "full-service" independent technical writer offer? I will suggest some possibilities here, concentrating on system configuration, word processors, and printers.



A writer's system usually serves two purposes. It's a word processor, and it's a machine on which you can test products and create examples. Because no single article can even begin to address the requirements of the many packages on the market, I'll concentrate on a word processing configuration that can be adjusted according to the requirements of the products you document.

To operate as a word processing system for the technical writer, the PC should have two floppy disk drives. Two double-sided drives are the minimum configuration, one for the word processor and one for the documents. A double-sided drive provides 320K bytes of storage (or 360K with DOS 2.0 or 2.1), which is plenty of room to store the text for all but the largest manuals.

You'll probably need a system with 256K RAM. The more memory the better, but 256K is adequate in most cases. Many of the faster word pocessors keep an entire document in memory while editing it. With 256K, word processors can create documents of from 50 to 100 pages in length.

Extra memory not needed by the word processor can be used as a disk emulator to improve performance. Extra memory is also important for program testing. Often, companies' prototype packages (the ones writers are often forced to use) require much more memory than the streamlined final versions. More memory often gives you the ability to test products earlier.

You'll also need an IBM monochrome monitor. Many software packages require the graphics adapter board; but even so, the clarity of the monochrome monitor is better for word processing functions. A graphics adapter card and alternate monitor should be an option for writers who document graphics packages, but, in any case, a monochrome monitor is advisable for all systems.

Word Processing Packages

There are several important features that every technical writer's word processing package should include.

- *Ease of use*. This is a nebulous term, but it is important. Word processors that require complicated series of keystrokes or

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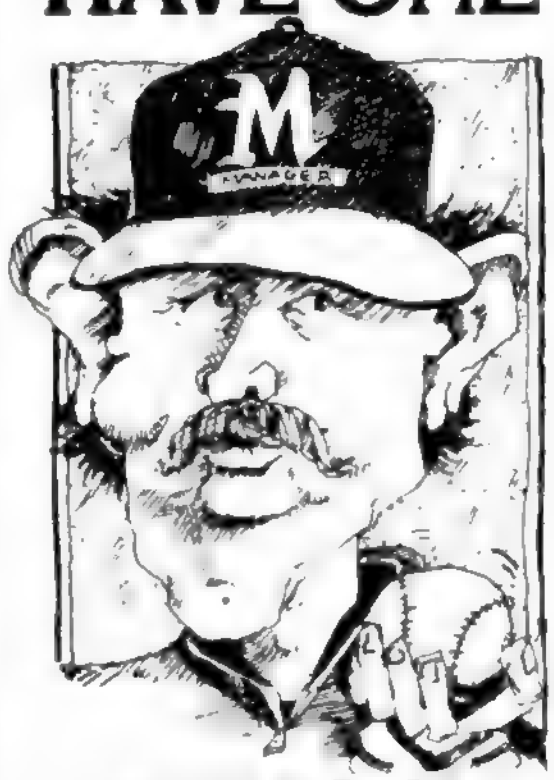

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frequent trips to the manual are deadly for the creative process. Before purchasing a package, you should extensively test such functions as insert, delete, copy, move, center, underline, boldface, tab, indent, set up a new tab line, copy from one document to another, and search and replace. All this must be at your fingertips.

• *Formatting capabilities.* As a technical writer, you must often produce camera-ready copy to send to the printer, so your word processor's formatting capability is important. It should support multiline headers and footers that can change throughout a document. It should permit a change of margins and typefonts anywhere within a document. It should support proportional spacing and should allow you to insert printer codes so you can take advantage of your printer's capabilities. Be sure that it can support underline, boldface, and shadow print. And finally, you must be able to create and modify tabular material. Finding a word processor that incorporates all these features is next to impossible, but you should be aware of the word processor's limitations before buying it, not after.

• *Ability to produce long documents.* Many technical manuals are hundreds of pages long. And, although good writers try to divide lengthy manuals into short, concise chapters, they often face lengthy reference chapters that cannot be further subdivided. To handle these situations, a word processor must be able to manage documents of perhaps a 100-page length or provide a facility to link documents at print time.

• *Compatibility with other products.* The word processor should have the ability to incorporate data produced by other packages, use standard DOS files for storing documents, and be able to produce output in ASCII format. The ability to read data produced by other packages allows you to create examples using the product to be documented. By reading in examples directly, you avoid transcription errors that often occur when copying complicated material from a listing to a manual.

If the word processor stores documents in standard DOS files, you can usually make use of other writing tools, such as spelling checkers, to aid the writing process. Spelling checkers will never eliminate the need for proofreading, because they are not complete, and they seldom check for grammar, punctuation, and omitted or repeated words. But they can catch simple mistakes.

> Word processors that require frequent trips to the manual are deadly for the creative process.

If your word processor can produce ASCII output, you can transmit directly to a typesetter or to your employer's word processing system, either on diskette or via modem. You can also create files of last-minute information that many companies like to send along on diskette.

Printers

When you work for small companies, you usually generate the camera-ready copy for manuals yourself. To do this, you must have a letter-quality printer.

There are two schools of thought concerning letter-quality printers. The first says that because of the vast number of pages that technical writers generate, they need top-of-the-line (30 to 50 characters per second) letter-quality printers. The second argues that having two printers is better: a fast dot-matrix printer for draft copies and an inexpensive (and usually very slow) letter-quality printer for final copy.

If you always use a letter-quality printer to produce text, even your review drafts will be easy to read and professional looking. Employers often judge a writer's work by the way the words look on paper, and high-quality review drafts can make employers feel that they are getting some-

thing extra for their money.

But regardless of the approach you take, there are certain features a letter-quality printer must have.

- *Reliability*. Writers' worst nightmares often involve printer breakdowns when generating camera-ready copy. Because writers must adhere to strict deadlines, they cannot afford mechanical failures. Their printers must be reliable.
- *Full character set*. A writer often has to document programs that use special characters such as circumflex (^), backslash (\ ), vertical bar (|), tilde (~), curly braces ({ }), and brackets ([ ]) in their commands. Many of the inexpensive printers are unable to print all these characters. When buying a printer, you should ensure that complete ASCII character print wheels are available.
- *Special features*. To produce camera-ready copy, the printer must be able to underline and produce shadow or bold print. Support for proportional spacing and microjustification is also advantageous. These features contribute to the professional appearance of final copy.
- *Compatibility*. The printer should be compatible with your word processor. There are many lesser-known printers that promise a full set of features at a low price. Printer features are useless, however, if the word processor doesn't support them. You should select a word processor first; then choose a printer that works well with it. And, to avoid being stuck using an outdated word processor when new and improved packages come out, you should choose a popular printer that is likely to be supported by future software developers.

The IBM PC can be an ideal system for technical writers, especially those who document PC products. It is inexpensive when compared to dedicated word-processing systems, and when equipped with the right hardware and software, it can be just as powerful. Although it might not turn the average technical writer into a millionaire, many independent writers are discovering that PCs are allowing them to turn out more and better manuals. ■

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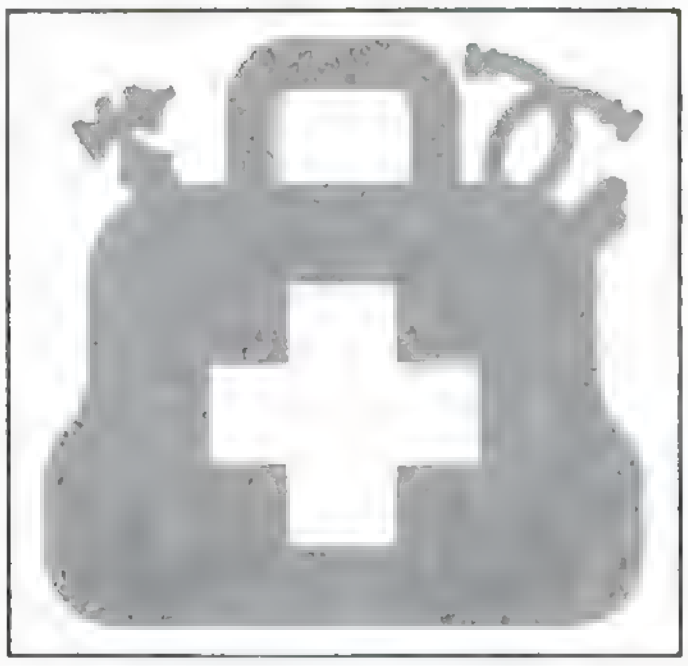
My current field of research is mushroom poisonings, and I make a serious effort to keep up with all the literature on this topic. Before I started using a PC as a database manager, I used to wrack my brains trying to remember things such as whether an article on liver necrosis secondary to Amanita mushroom poisoning had been filed under "mushroom toxins," "amanitins," "pharmacology," or "liver disease." My filing system consisted of hundreds of poorly organized 3-by-5 index cards. I needed about half a dozen index cards for each article, one for each key word and a card for the author's name. Each card had to contain all the information concerning the article (title, author, journal, pages, year) and, in addition, an indication of which folder actually contained the article.

The program that I wrote, *MEDLIT Manager*, is a series of *dBASE II* command-file programs that organize my entire collection of medical and scientific literature.



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The beauty and versatility of *dBASE II* become apparent when you want to display and print longer records in a specific format or set up a system that can be used by someone with absolutely no knowledge of *dBASE II*'s command language. This type of application calls for a series of programs, called command files, written in the *dBASE II* language. Here's how I created *MEDLIT Manager*.

Before I wrote the command files for *MEDLIT Manager*, I had to create the *dBASE II* data file that would store the information for my literature references. *dBASE II* provides a simple CREATE command to do this. I had previously decided that I wanted to store nine categories of information for each article and to allow a specified maximum amount of space (number of characters) for each category (see Figure 1).

Each of these nine categories is called a field. The nine fields make up the structure for each record in the data file. The organization of the entire data file with all its records can be likened to a huge table of information in which each row contains the data (the record) for a single journal article and each column is one of the nine fields.

To create this data file, load *dBASE II* and type CREATE. Then answer the questions that appear on the screen until the display looks similar to Figure 2.

The entry shown in field 002 is a typical one. It indicates that the name of the field is Title, that it consists of characters (designated by C) rather than numbers (designated by N), and that it may contain up to 150 characters.

The system is very simple to use. As I

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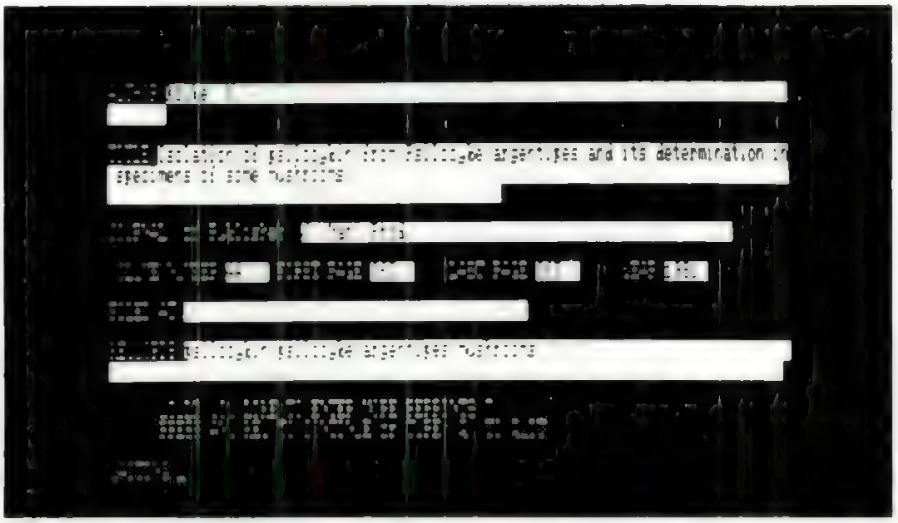

This reverse-video screen from *MEDLIT Manager* allows you to enter bibliographic and other information about medical articles by merely filling in preset fields and assigning key words. This information is then compatible with all *dBASE II* commands.

read through the medical journals and my reprints from MEDLINE, I just tear out each article that I think I might be interested in. For example, the recent *Annals of Emergency Medicine* (Volume 12, 1983) ran an article entitled, "Epidemiology of Cardiac Arrest and Resuscitation in Children." In the margin of the article I jotted down the following key words: cardiac arrest, pediatrics, arrhythmias, drowning, anaphylaxis, and sudden infant death syndrome. I underlined the key word *cardiac arrest* to indicate that this was the category under which this article should be filed. The article is then entered accordingly on *dBASE II*.

Searching through MEDLIT

MEDLIT Manager also retrieves articles fulfilling certain criteria. For example, suppose I had to give a seminar next week on the emergency evaluation of head injuries. To prepare my discussion, I would need to find out what references to the subject I have on file.

One of the simplest ways to search the database is to use *dBASE II*'s built-in LOCATE function in conjunction with the $ substring logical operator. These functions allow you to enter commands, such as [LOCATE FOR Head Injury $ TITLE], and retrieve every article in the database that has the phrase *Head Injury* in its title. Similarly, you can search through all the key words of each article for specific terms such as coma, neurology, or subdural hematoma. This way you can access articles that may be relevant but do not include the words *head injury* in their titles. Using *MEDLIT Manager*, I can prepare a bibliography of all my reprints of articles on head injuries or any other subject of my choosing.

DBASE II is a versatile tool for organizing and creating a personal database manager like *MEDLIT Manager*. (For a copy of the program, send $25 to Scott Camazine, 36 Dove Dr., Ithaca, NY 14850; a printout is available for $10.) These days even medical specialties and subspecialties generate hundreds of publications and keeping up with developments is an endless task. A personal database manager can help keep you from being left behind. ■

Scott Camazine is an emergency-room physician in Ithaca, New York, who has written for PC Tech Journal.

```
1) author (80)
2) title (150)
3) journal or publisher (50)
4) volume number (5)
5) first page of the article (5)
6) last page of the article (5)
7) year of publication (4)
8) folder in which the article is filed (40)
9) keywords or summary (150)
```

Figure 1: *The nine catagories of* MEDLIT Manager *and the number of characters of storage allowed for each one.*

```
ENTER FILENAME: REPRINTS
ENTER RECORD STRUCTURE AS FOLLOWS:

FIELD          NAME, TYPE, WIDTH, DECIMAL PLACES

001            AUTHOR, C, 80
002            TITLE, C, 150
003            JOURNAL, C, 50
004            VOLUME, C, 5
005            FIRST:PAGE, C, 5
006            LAST:PAGE, C, 5
007            YEAR, C, 4
008            FILED:AT, C, 40
009            KEYWORDS, C, 150
010            [ENTER]
```

Figure 2: *The completed structure of a* MEDLIT Manager *data file.*

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Constructive Computing

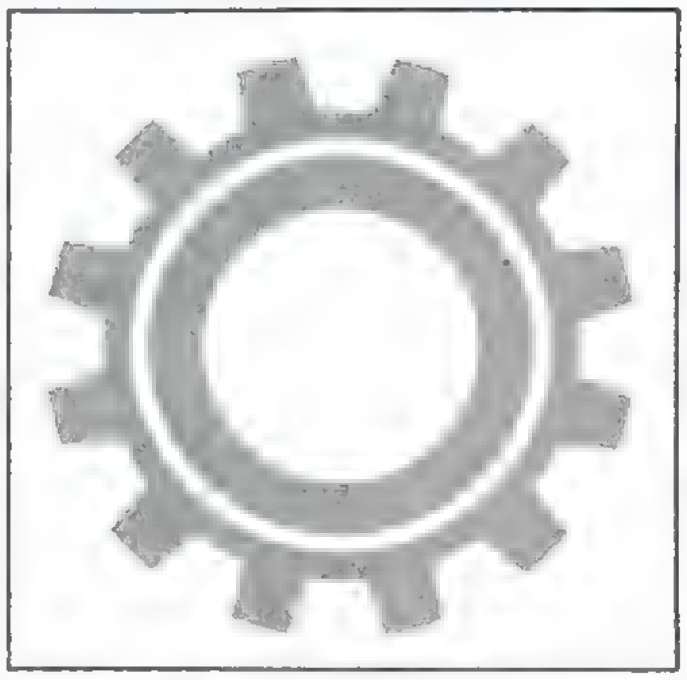
The PC has become the favorite micro of the construction industry. Here's an overview of the applications for which contractors are using PCs in their workplaces.

IBM and the construction industry go back a long way. Since the early sixties when System 3s were used to crank out payroll, to the late seventies and early eighties when the System 32 and 34 ran the *Construction Management Accounting System (CMAS)*, IBM has dominated the construction market. More recently, the IBM PC has quickly grabbed the lead as the computer of choice among large and small contractors alike.

Contractors are traditionally brand loyalists. They stick with names they know—Caterpillar, Mack, and Xerox, for example. Thus IBM's endorsement of microcomputers in 1981 with the introduction of the PC gave many contractors reason enough to purchase this curiosity. Since then, contractors have been purchasing micros to do everything from computing a simple estimate to maintaining a complete accounting system.

That the IBM PC has become the micro of choice was confirmed by a recent reader survey conducted by *Construction Computer Applications Newsletter*. Of the 786 computers used, 66 percent were microcomputers. A full 30 percent of the micros were IBM PCs, which represented 20 percent of all the computers reported and 22 percent of the companies responding.

Exactly how are these PCs being used? There is a vast array of administrative and accounting functions in which the PC can



enhance productivity, including estimating and bidding; payroll and bookkeeping; job cost control; document and drawing control; contract administration and billing; planning and scheduling; equipment inventory and purchasing; engineering survey and layout; real time applications and process control; and communications. Here's an overview of these categories.

Estimating and Bidding

Estimating is where the entire construction process begins. The contractor must estimate the cost of a project in order to submit a bid or negotiate a job. All other things being equal, the more accurately and the more frequently a contractor is able to estimate work, the more successful he or she will be. More bids mean a higher probability of winning a job; more accurate bids mean a higher probability of achieving the expected profit amount. Since the computer can assist with both speed and accuracy, it is a natural estimating tool for the contractor.

Fortunately, estimating is also one of the easiest and most cost-effective ways for a contractor to get involved in computing. From a Compaq using *1-2-3* to an XT with the latest mouse-driven estimating program, the computer will quickly pay for itself in helping the contractor get out more bids while greatly reducing calculation errors.

Two of the most often reported side benefits contractors derive from a computerized estimating system are neatly typed and formatted output plus the ability to make changes and reprint the results quickly. This feature not only impresses clients, but also lets the contractor help the clients evaluate proposed changes or alternatives brought up during negotiation sessions. This feature alone has been cited more than once as justification for acquiring a computer.

Payroll and Accounting

The introduction of the XT and low-cost hard disk add-ons for the PCs and PC compatibles now make it possib'e for even the small contractor to take advantage of sophisticated accounting systems previously available only to larger contractors

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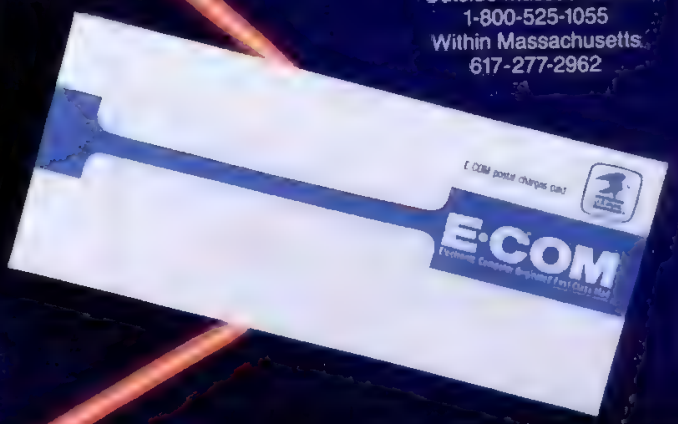

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with mini and mainframe computers. A number of accounting programs are available for the PC, ranging from general purpose bookkeeping software to more specialized systems designed to handle multistate union payroll and workmen's compensation.

Data derived from payroll and accounts payable, once processed through a job cost system, will provide the manager with vital productivity information. Cost per work item, productivity per man hour, and relative productivity between different crews are all indications of the performance of the contractor's forces. With the computer's quick turnaround of this information, the project manager can take steps to improve performance. This information is also useful for estimating new work.

Word processing software on microcomputers is quickly replacing the typewriter for many functions. However, with either a word processing program or one of several popular file management programs, the microcomputer becomes an adept little device for producing and tracking documents, especially for producing exception reports that let the manager know what drawings have not been approved or what correspondence remains unanswered.

Other documents that can be easily computerized include correspondence logs, change orders logs, inspection reports, truck routings, and equipment maintenance schedules.

Contract Administration

Administration of contracts and subcontracts is aided by the PC. Word processing may be used to draw up contract documents, prepare punch list and inspection reports, produce installation and operating instructions, and write up change orders and contract modifications.

Construction contractors are frequently paid on a monthly basis for work completed, a process that may, for a large project, take 2 or 3 days each month. File management and spreadsheet programs make it easy to keep track of work items completed each pay period and recomputing the total-to-date. A number of the newer integrated computer programs will not only produce the payment requests, but the graphics options may be used to plot the contractor's progress to illustrate his or her budget and schedule status.

Whether a job requires submission of approved critical path method (CPM) network diagrams or merely a simple calendar/appointment system to help organize a project manager's personal schedule, there's a complete range of programs available for the PC. The biggest advantage of computerizing schedules is the ease with which they may be changed. Scheduling becomes a productive tool instead of a paperwork hassle.

Portable computers are gaining widespread acceptance as contractors lug them around from job site to job site.

A computer can help to maintain control of large inventories of materials or equipment. Depending on the particular job setup, it may be advantageous to integrate equipment and material control with the other accounting functions, providing equipment cost reports and posting costs to jobs as equipment is utilized and inventories used up.

Purchase order writing can be automated, and purchase orders may be tracked on the computer through each step of the ordering process: request for quote, formal order preparation, drawing submission and approval, receipt in warehouse, delivery to job site, installation, and finally delivery of warranty papers to the owner.

From piping systems to wall and column locations to center line of roadways, the contractor must work with drawings and calculator to locate work in the field. Using survey programs, computer graphics, and computer-aided drafting and design (CADD), the PC can make site plots and contour maps, cross-section diagrams, and piping schematic drawings. Other uses are limited only by the imagination and skill of the user and the sophistication of the particular program.

Real time applications of the computer include controlling concrete mixing operations, recording payroll information directly off computer-readable media (such as magnetic strips on plastic cards), equipment performance measurement, and bar code systems for inventory control.

Other topics that fall under this heading include operations research and computer simulation of construction tasks; for example, computing the optimum equipment spread to perform cyclical tasks, such as an earthmoving or paving operation, is a likely computer application.

Communications

Communications is especially pertinent to contractors, as they frequently operate out of a central office but have job sites spread out over a wide geographical area. PCs may be maintained on location at the various sites to enter time card and scheduling information, which can be sent via modem to a central mini or mainframe computer for processing.

Portable computers are gaining widespread acceptance as contractors lug them around from job site to job site, to bid locations, to the main office, and home. From all locations, cost and schedule information may be transmitted to other areas as needed.

Future articles will examine these categories in detail and discuss applications that are on the market today. ■

Paul Levin is a civil engineer with 14 years of experience in project administration and consulting in the construction industry. He has spent the last 4 years as publisher for Construction Industry Press in Silver Spring, Maryland.

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CIRCLE 191 ON READER SERVICE CARD

PC Buyer's Guide For Lawyers

Here's a guide for transforming the traditional lawyer-client relationship into the lawyer-PC-client relationship. Now you can cost the computerization of your practice yourself.

For lawyers mulling over whether to acquire a PC, one way to lower resistance to the initial outlay is to reduce the cost to a financed monthly payment. I bought my PC this way, and the strategy worked. I soon realized I could not afford to be *without* a computer.

An entry-level system for a lawyer runs about $5,000, as shown in Figure 1. The good news is that $5,000 financed at 14 percent over 36 months will cost $170.89 per month, a total of $2,050.68 per year, or 99 cents per hour.

The price isn't the first question you need to ask. Your first job is to work your way through a series of questions on word processing, information management, calendar and docket control, time and billing, communications, financial statements, and payroll. Tax benefits and depreciation strategy are two additional topics for careful scrutiny.

For now, you should take stock of your operations, answer yes or no to the questions that follow, and assign a value to the things you want. Your decision to buy or not to buy will automatically follow this effort.

Word Processing

Would you like to be able to record all your standard legal documents and letters so that they can be used again without having to be retyped? When you prepare your

memoranda or briefs, would you like to be able to make corrections knowing that the entire memo won't have to be typed again? With word processing, you can type quickly and correct errors later. Would this capability improve performance? When you come in on the weekend, would you like to be able to put a document together from prerecorded material and print it yourself with only a few keystrokes? If you've answered yes to these questions and the word processing options are worth $1 an hour to you, then you've met the first year's (hypothetical) payment of $2,051.

Information Management

Does your office maintain a file of clients listing names, addresses, and telephone numbers? Would you like to have a list of your firm's lawyers that indicates which cases each lawyer is currently handling, or conversely, a list of all current cases that indicates the lawyer who is assigned to each? The tally can be further refined by indicating the court that has jurisdiction in a given case. Would you like to be able to type in this information once and immediately retrieve needed portions by a sort-and-select technique? If this information management capability is worth $1 a day to you, you have just allocated $260, the number of working days in a year. Perhaps you currently have a manual system to keep track of appointments, deadlines, important dates, and so forth. If it is worth $1 a day to you to automate your calendar control, you should be willing to commit an additional $260 toward the purchase of a computer. The same is true for your timekeeping and billing systems. Automating these procedures so that you can, for instance, send bills promptly and maintain an inventory of unbilled time is worth $520 toward a computer purchase. Are you willing to spend a mere $2 a day for this convenience?

Most law offices must prepare a huge number of documents and memoranda as part of the routine workload. Do you currently have a system that allows you to index various items that you have prepared so you can quickly locate them when needed? If not, inexpensive software from

Softshell, Inc., of Baltimore should soon be available that will permit you to enter a three-line description of the document or information you wish to retrieve together with a file address and then immediately find the entry using any key word or combination of key words appearing in the description. If this capability appeals to you, cast off another $260 worth of resistance.

Do you currently receive a monthly financial statement for your law practice? If not, would you like to have one? If so, is it worth $25 a month? Perhaps your payroll is still prepared by hand. But for about $10 a pay period, the computer can do the job for you and prepare your quarterly returns and W-2 forms automatically. The computer can also help you to make year-end income tax projections and "what-if" calculations for business clients, who may be willing to spend as much as $100 an hour or more for the service. The computer can prepare cash flow projections for your office as well. Would you like to be able to make estate tax projections for your clients in record time, using the computer? An easy calculation should tell you how much the computer's ability to do this work quickly will be worth to you.

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	Additional disk drive (360K)	423
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	Subtotal	$3,298
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	For heavy-duty word processing or data processing, you should initially buy a faster and hence more expensive printer. Prices range from $495 to $2,500.	
Printer Cable		55
Software Budget		988
	Start with a good word processor, spreadsheet, and database manager. You will probably want to spend at least another $1,000 for software once you master the software you buy initially.	
	Total	$5,000

Figure 1: *An entry-level system for $5,000. The prices come from ComputerLand in Columbia, South Carolina, and represent a plain-vanilla hardware system without innovations, discounts, or cost-cutting maneuvers (except for the monitor).*

No More Paper Chase

Do you have occasion to send documents from one office to another—to a client, another lawyer, or branch of your own firm? Would you like to access Westlaw, LEXIS, and other on-line databases? If the ability to do so is worth $1 a day, set aside another $260 for your computer (the modem necessary for the communications linkup will cost $150 to $500).

By this time, you may have a clearer picture of the computer's potential contribution to your practice, both operationally and financially. If you're still unsure about making the investment, you should consider the tax advantages. You can receive an investment tax credit for 10 percent of the hardware and software purchase. It amounts to a one-time, dollar-for-dollar credit that will reduce the year's cost by the amount of the credit. If, for instance, you buy our entry-level system in 1984, you will receive a credit of $500 toward your 1984 taxes.

If you finance the purchase, the interest constitutes a tax deduction, and you can depreciate the hardware and software over five years for an additional saving (15 percent the first year, 22 percent the next, and 21 percent for each of the next 3 years). Alternatively, you can forego the investment tax credit and the annual depreciation by deducting the entire cost of depreciable items (not to exceed $7,500) in 1984.

Perhaps in the near future clients will view the computerless lawyer as inefficient or out of date. The stigma could be costly, though at this stage of the game the risk is purely speculative. What is not speculative, however, is the advantage of having a computer in the law office to free up your time to practice law. It is time to enter the computerized world. ■

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CIRCLE 315 ON READER SERVICE CARD

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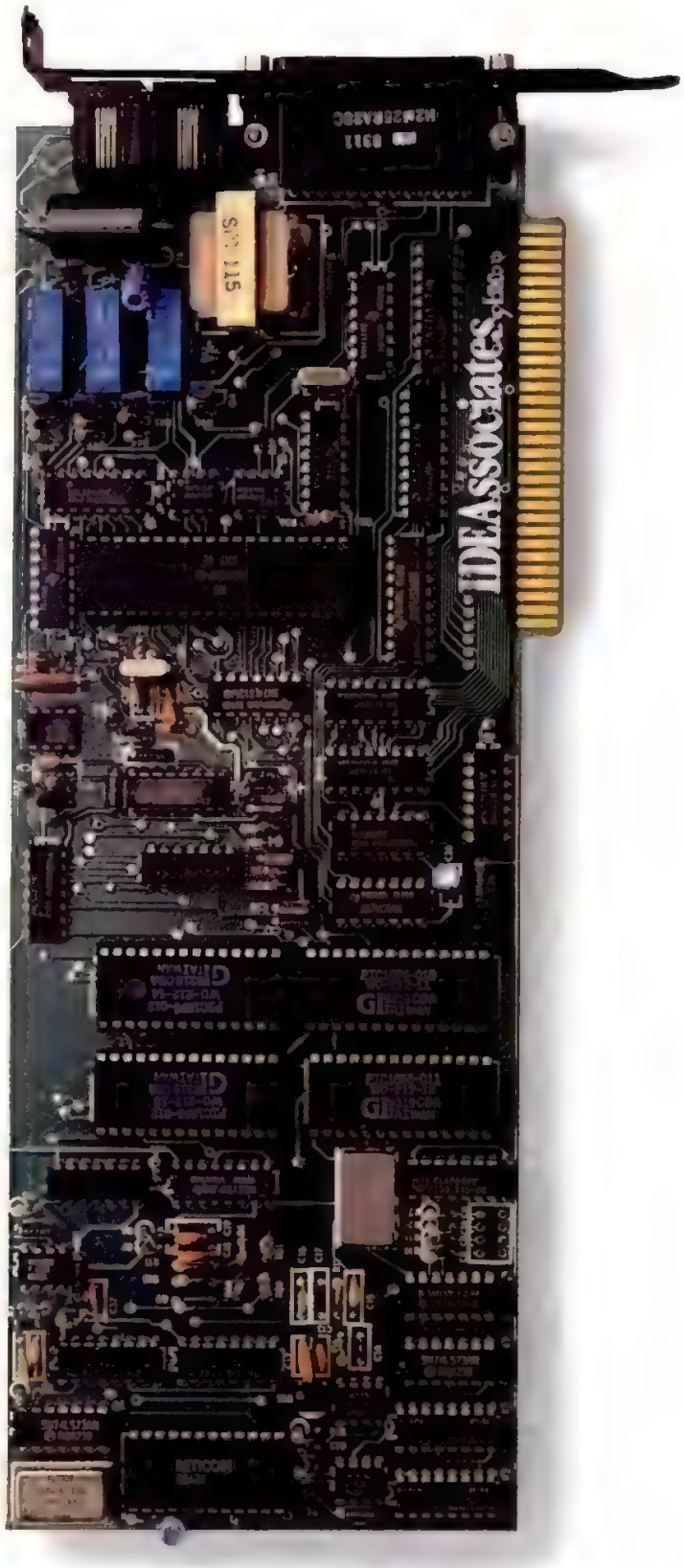

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The IDEAComm 1200: Fast, reliable communications on a plug-in card.

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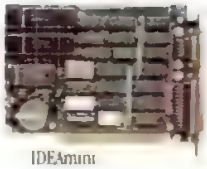
Technical Specifications	
Speed	**IBM Port**
0-300 bps or 1200 bps	COM 1 or COM 2
Data Format	**Modem Compatibility**
Serial, binary. 7-8 data bits, 1-2 stop bits	Bell System 103 or 212A in both Originate and Answer mode
Dialing Capability	**Physical Data**
Touch-Tone (TM) or rotary dial pulse	13⅛" x 4¼" x ½" (one card slot)
Operation	
Full Duplex	



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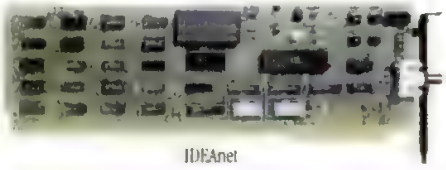

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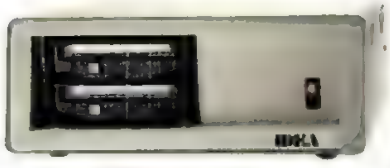

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CIRCLE 175 ON READER SERVICE CARD

Making The PC Teacher's Pet

The Computerized Lesson Authoring System helps teachers create flexibly formatted lessons and exercises for the PC in any subject and for any grade level.

If you are a teacher—any kind of teacher—it is safe to assume that you usually have a great deal of your own "homework" to do. Lesson planning, in fact, can take up most of a teacher's free time. Fortunately, now there is a software program, the *Computerized Lesson Authoring System (CLAS)*, that can help you create lessons for your classes quickly and easily. These lessons can cover a single topic or an entire semester's coursework and can be customized for individual students. You can use this program to design courses for any level from kindergarten through college and in any subject from basic arithmetic to spelling, grammar, physics, or economics. The potential applications are infinite.

CLAS is very flexible. Unlike some other educational software, it is not meant only for creating quizzes, but also for designing self-teaching lessons with exercises. Nor is it a set of boilerplate lessons that you cannot change. It allows you to program the computer with your own materials and your own teaching methods. Parents can also use *CLAS* at home to design special lessons directed at a child's learning problems.

The program caters to the inexperienced by using prompts and language that is understandable to everyone. It offers help at every stage of creating and using the lessons. Because the program design is so user-friendly, *CLAS* can also be a good introduction to computer use for teachers, many of whom have been reluctant to bring computers into their classrooms but are now under pressure to do so.

To use *CLAS*, you write your courses and lessons on the Author disk and later transfer them to data disks. The Student disk controls the data disks and can be booted onto any number of PCs. Each lesson generally consists of a short body of text on a particular subject, followed by a set of exercises in one of four formats: fill-in-the-blank, multiple choice, true/false, or matching. The exercises can also be tied in with the student's reading or with class discussion.

Getting Started

CLAS operates with a series of prompts, some of them optional, which you request by pressing the F2 key. All prompts are preceded by a dollar sign ($). The program also makes use of two other function keys: F10 for quick help and F1 for exiting.

The program begins with an A> prompt, at which you type the disk name, Author. When you press F2, it prompts for a Filename. Assume you are creating a file entitled Artist. After these preliminaries, you create a course title, which should be a single line under 20 characters, for example: $Course Renaissance Art #1.

The next two prompts, $Author and $Copyright, are optional information that you can include in the text. Press F2 again and you get the $Lesson prompt. Here you can insert a title, such as $Lesson: Michelangelo. You can also put a body of text here on the subject you are treating.

Computerized Lesson Authoring System (CLAS)
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609 South Escondido Blvd.
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(800) 525-CLAS, in California
(800) 325-CLAS
List Price: $89.95
Requires: DOS 2.0, 128K RAM, one disk drive, blank data disks for lessons.

CIRCLE 712 ON READER SERVICE CARD

Now you are ready to prepare the exercises. At the $Problem prompt, you enter questions in one of the four formats and place the answer within brackets. When the question is transferred to a lesson disk, the answers are dropped out and blank lines appear so that students can insert their own answers. The correct answers are available to students only when the help key (F10) is pressed.

The line on which you are typing is always highlighted, and a message at the bottom of the screen suggests the input that is expected.

For text entry, *CLAS* uses its own word processor, called Touch Typer, rather than the cumbersome EDLIN text entry system that is part of DOS. You can enter text in random length lines or use an automatic wrap function. Once you've entered it, you can edit to make changes.

You have several design options available: you can create columns, indented lists, or start new pages where needed. You may also print, delete, review, or revise a lesson.

File Size

Each file can contain up to two courses, ten lessons in each course. There can be 30 problem sets per lesson and each problem set can contain up to ten questions per screen. Each lesson, however, can have only 150 lines of text. For multiple courses on one subject, you can piggyback courses, write as many as a data disk can hold and then create "Part 2" on another disk. A single subject might therefore be comprised of two, six, ten or more courses, each with ten lessons, each lesson with several questions. Students could work with some or all of the lessons at their own paces to satisfy individual requirements.

Once they are created, you can copy the lessons onto as many data disks as you need so that many students can work with them simultaneously, or as long as the student disk is booted onto each machine. The Author disk can be reused and lessons may be revised, deleted, or saved onto a storage disk at any time.

Unfortunately, *CLAS* includes no facility for flagging your spelling or typographical errors, although you can easily edit the lessons to correct them if you find them yourself.

The program does not take advantage of the PC's graphics capability and it only uses sound when the student enters an answer.

Unlike some programs, it does not tell the teacher how to structure a course, but that's the whole point, according to a Touch Technologies spokesperson. Teachers should prepare their courses on paper and structure them along their own lines.

Procedure for Students

When a student calls up CLAS, he or she sees a screen divided into three parts. The top and bottom panels are in reverse video. The top lists the name of the course, the lesson, page number, and problem number. The bottom panel displays the exit and help prompts. When the student gives an answer, a message indicating whether the answer is correct or not appears in the center of this panel.

The central area between the panels displays reading material and/or questions. If a question appears, the cursor stops where the answer is to be placed.

When the student enters a wrong answer, the machine beeps and the help message flashes. The student may try again or hit the F10 key to request help. However, the correct answer must be typed in (spelled correctly) before the next question will appear. The student can't just skip the question.

When a correct answer is entered, the machine plays a short tune. One of several congratulatory words flashes in the bottom panel, such as "right," "good," "excellent," "perfect," or "correct." (The F5 key will turn the sound off or on.)

CLAS summarizes the student's performance at the end of the lesson by stating the number of questions answered correctly and incorrectly. Those that were incorrectly answered are redisplayed for review. The entire lesson may be repeated, but the next time around, the same questions will be in a different order and the student must go through them all without skipping any. However, the student may select another lesson or quit.

Documentation and Packaging

The *CLAS* package consists of one Author disk, one Student disk, and a manual. The typewritten manual is thorough, yet to the point. It describes specific procedures for using the program with the IBM PC. The bound book is 94 pages long and measures 5¼ by 8 inches, which is a handy size for carrying around but awkward for graphic design. The text is consequently in short blocks with long lines, making it difficult to get an overview of the material. It includes several examples of prepared lessons, one of which is also given on the Author disk. The manual has a glossary but no index.

The Author disk is copy-protected, but registered users may purchase one backup disk immediately from the dealer for $9.95. For school systems that need many copies, Touch Technologies will work out a flat-fee licensing agreement based on a recommendation by CUE (Computer Using Educators). This agreement will allow an unlimited number of copies to be used in one school building or complex for the set fee.

In addition to the PC version, *CLAS* is also available for PC*jr*, Commodore, Apple, and Acorn.

CLAS is certainly worth its low ($89.95) price, and it is adequate for its purpose. Many "authoring" programs for the educational market are both more sophisticated and more expensive, but many are less flexible and harder to use, especially for the computer novice. ■

Dona Z. Meilach writes extensively for computer publications, and is the author of Before You Buy A Computer, The Perfect Guide to Perfect Writer, *and about 70 other titles.*

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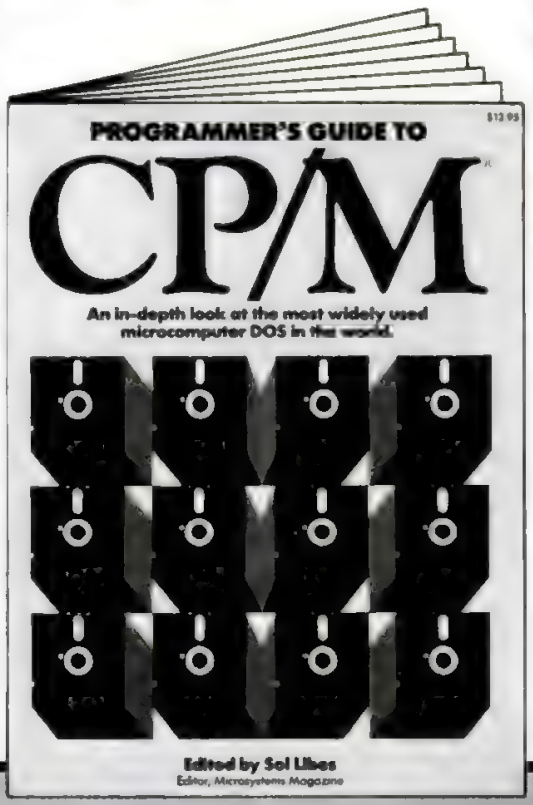
PROGRAMMER'S GUIDE TO CP/M®

Edited by Sol Libes

Here's an important collection of CP/M insights that you'll never find in any CP/M manual. CP/M is the most popular microcomputer DOS in use today, and this widespread use has generated many innovative techniques and enhancements of CP/M. *Programmer's Guide to CP/M* tells you what these enhancements are and how to put them to use, how to get around apparent limitations of a CP/M system and why CP/M is far more versatile than you might have imagined. Every article in *Programmer's Guide to CP/M* originally appeared in MICROSYSTEMS between January 1980 and February 1982. Except for this collection, these articles are now unavailable! *Programmer's Guide to CP/M* gives you an in-depth look at CP/M from the viewpoint of the programmer—the individual who creates the software that interfaces directly with CP/M, or who is installing CP/M on systems for which configurations do not already exist.



Contents include "An Introduction to CP/M," "The CP/M Connection," "CP/M Software Reviews," "CP/M Utilities & Enhancement," "CP/M 86" and "CP/M Software Directories." 200 pages, $12.95.

CP/M is a registered trademark of Digital Research, Inc

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New On The Market

HARDWARE

IDEAgraph

A color graphics board offering 128K or 256K of RAM and up to 256 colors selectable from a palette of 4096. The IDEAgraph board is available in either 28MHz or 40MHz versions, and features automatic line, circle, vector, and space filling functions. Other features of the board include a hardware-controlled zoom factor of 1 to 16 used to highlight specific areas of the display, and a software-controlled blink feature which can be used to cause display blinking on a pixel-by-pixel basis.

The IDEAgraph board is designed around an NEC 7220 chip. With 128K of RAM, the board can produce four color planes (16 colors) at the resolution of a standard IBM color monitor (640 × 200 pixels). With 256K on board the 40MHz version, the IDEAgraph card can produce 256 colors selectable from a palette of 4096. Optional color outputs are Red-Green-Blue-Intensity (RGBI); TTL with color mapping to take advantage of the wide range of colors; RGB analog (with a 4096 color palette); and NTSC composite video.

Each board comes with software including IBM-compatible BIOS, IDE-extended BIOS, and a virtual device interface (VDI) designed to link with GSX.

(List Price: $895-$1895)
IDE Associates, Inc.
7 Oak Dr.
Bedford, MA 01730
(617) 272-4430
Telex: 94 8245

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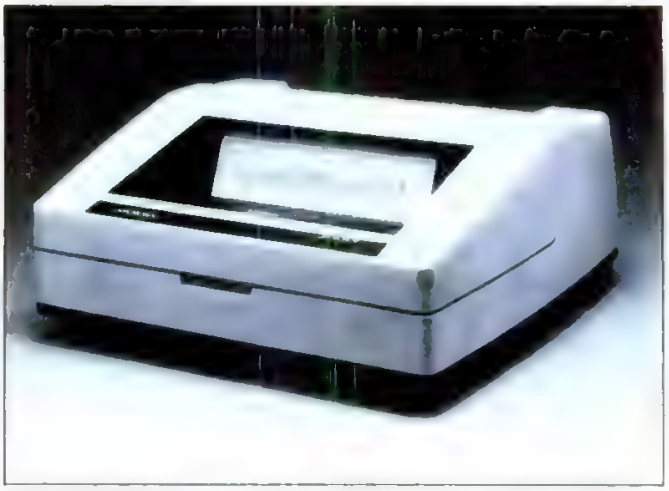


***MVP 150B Printer,** Printronix, Inc.*

PC-STOR

A Winchester hard disk drive with integrated cartridge tape backup unit. The hard disk is available with formatted storage capacities of 33 or 43 megabytes, and features rapid access times averaging 38 milliseconds. The incorporated tape backup unit offers 16.5 megabytes of formatted storage capacity per cartridge tape, and data transfer rates of 0.7 megabytes per minute with over-lapped I/O.

The PC-STOR package includes drivers and links for PC-DOS or CP/M-86, and a file-oriented tape support program called PC-TIP.

(List Price: 33Mb, $4,995; 43Mb $5,995)
Alloy Computer Products
100 Pennsylvania Ave.
Framingham, MA 01701
(617) 875-6100

CIRCLE 797 ON READER SERVICE CARD

DATACAM I & DATACAM 35

Two video screen cameras, for creating photographic reproductions of CRT images. The DATACAM units are designed to be held directly on a user's 12 or 13 inch CRT monitor screen. Larger units are also available for taking photographs from 19 and 21 inch monitors.

The DATACAM I produces instant 3 × 4 inch color prints, using Kodak Trimprint instant color film. The DATACAM 35 uses 35mm film, and can be used for making color prints and slides. With the optional AutoProcessor unit available from the manufacturer, and Polachrome 35mm film, a user can take and develop finished slides in a matter of minutes.

(List Price: DATACAM I $545; DATACAM 35 $875)
Photographic Sciences Corp.
770 Basket Rd.
P.O. Box 338
Webster, NY 14580
(800) 962-7370
(800) 828-3030 in NY

CIRCLE 796 ON READER SERVICE CARD

Printronix MVP 150B

A dot matrix line printer capable of four print modes: correspondence quality at 80 lines per minute; draft printing at 150 lines per minute; condensed print, which can produce 132 column reports on standard 8½ inch paper, at 100 lines per minute; and expanded print mode, creating large size characters, at 120 lines per minute.

Built for print-intensive applications, the Printronix printer can be linked to cluster controllers or network printer sharing lines.

(List Price: $3745)
Printronix, Inc.
17500 Cartwright Rd.
P.O. Box 199559
Irvine, CA 92713
(714) 549-7700

CIRCLE 798 ON READER SERVICE CARD

3270 Terminal Emulation

A hardware/software package permitting a user to access mainframe systems as an IBM 3270 terminal. Designated the PS-3270/BNC, the package consists of a PS-ICP Intelligent Communications Processor board and proprietary emulation software.

Depending on the hardware and software options selected, the PS-3270 system can emulate the following IBM 3270 systems:

- Level 1: Single station IBM 3276-2 Control Unit/ Display Station with attached 3287 printer.
- Level 2: Small cluster system 3276 Control Unit/ Display Station with 3287 printer and three downline stations for a cluster of four personal computers.
- Level 3: Large cluster system IBM 3274-51C cluster controller, with 3287 printer and 13 personal computers emulating 3270-2 stations.

The Z-80 based front-end processor incorporated in the package includes a multi-tasking executive, permitting users to concurrently maintain 3270 host communications, perform host-generated printing, and support a cluster of up to 12 downline personal computers, all as background operations while the user continues with local processing.

(List Price: Level 1: $1295)

ABM Computer Systems
23362 Peralta Dr.
Laguna Hills, CA 92653
(714) 859-6531
Telex: 29 2427

CIRCLE 795 ON READER SERVICE CARD

***Transcryptor**, Cryptext Corp.*

TRANSCRYPTOR

A security device which can block unauthorized access to computers and terminals. The device automatically encrypts messages during transmission, decrypts same upon receipt, and can be configured to provide managerial control over employee access to files and systems.

The Z-80A microprocessor-based device has two RS-232C ports, and is placed on-line between the computer and modem or direct phone lines. Encryption and decryption are automatic operations, requiring no special operator commands. The unit generates its own encryption keys, a different key each time it is used.

The encryption software incorporated with the device provides automatic adjustment of baud rates from 150 to 9600 baud, and transmits data asynchronously. An error detection feature causes automatic resynchronization when line noise errors occur.

(List Price: $945)
Cryptext Corp.
P.O. Box 425
Northgate Station
Seattle, WA 98125
(206) 364-8585

CIRCLE 793 ON READER SERVICE CARD

***Protocol Converter**, Kaufman Research*

Multichannel Protocol Converter

A modular protocol converter supporting a range of asynchronous devices, on from one to eight channels. The model 870 unit converts binary synchronous protocols, including SNA/ SDLC, into asynchronous, emulating the IBM 3270 cluster controller. Model 871 converts Sperry Univac "Uniscope" protocol into asynchronous, emulating the UTS 400 terminal.

A microprocessor on each channel provides rapid async conversion. Each microprocessor has its own address space, permitting channels to be equipped with greater memory. Channels are parallel wired, permitting continued operation on other channels even if one channel fails. Future peripherals can be supported by the addition or replacement of a single module.

Data transmission rates

from 110 to 19,200 baud are selectable by a rotary switch on the front panel of each channel module. An auto baud rate detect feature can automatically determine the correct rate for each terminal.

Selection of asynchronous devices to be operated on each channel is menu-controlled. Any combination of devices, including alphanumeric or graphics terminals, microcomputers, printers, word processors, and Displayphones can be operated interchangeably.
(List Price: $3,395-$8,295, depending upon number of channels)
Requires: Terminal emulator communications software.
Kaufman Research Manufacturing, Inc.
145 E. Dana St.
Mountain View, CA 94041
(415) 962-8811

CIRCLE 792 ON READER SERVICE CARD

PC eXTender

A series of hard disk drives with multifunction disk controller board. The drive/controller board combination can provide a user with 10 or 15 megabytes of storage capacity, a serial port, a clock/calendar, sockets for as much as 192K of additional RAM, and software utilities, while occupying only one slot in the user's system. In addition, the PC eXTender combination can transfer data from the computer to the hard disk at up to one megabyte in three seconds.

To resist damage from contaminants and head crashes, the hard disk drive surfaces are coated with a hard thin-film media. The drives are shock-mounted to a cast aluminum frame, and can be fitted into the space occupied by one of the floppy drives within a user's system. Alternately, an external casing is available, with its own power supply and a switched outlet.
(List Price: 10 Mb $2,295; 15 Mb $2,595; for external units add $200)
Falcon Technology, Inc.
6644 S. 196th St., # T-101
Kent, WA 98032
(206) 251-8282

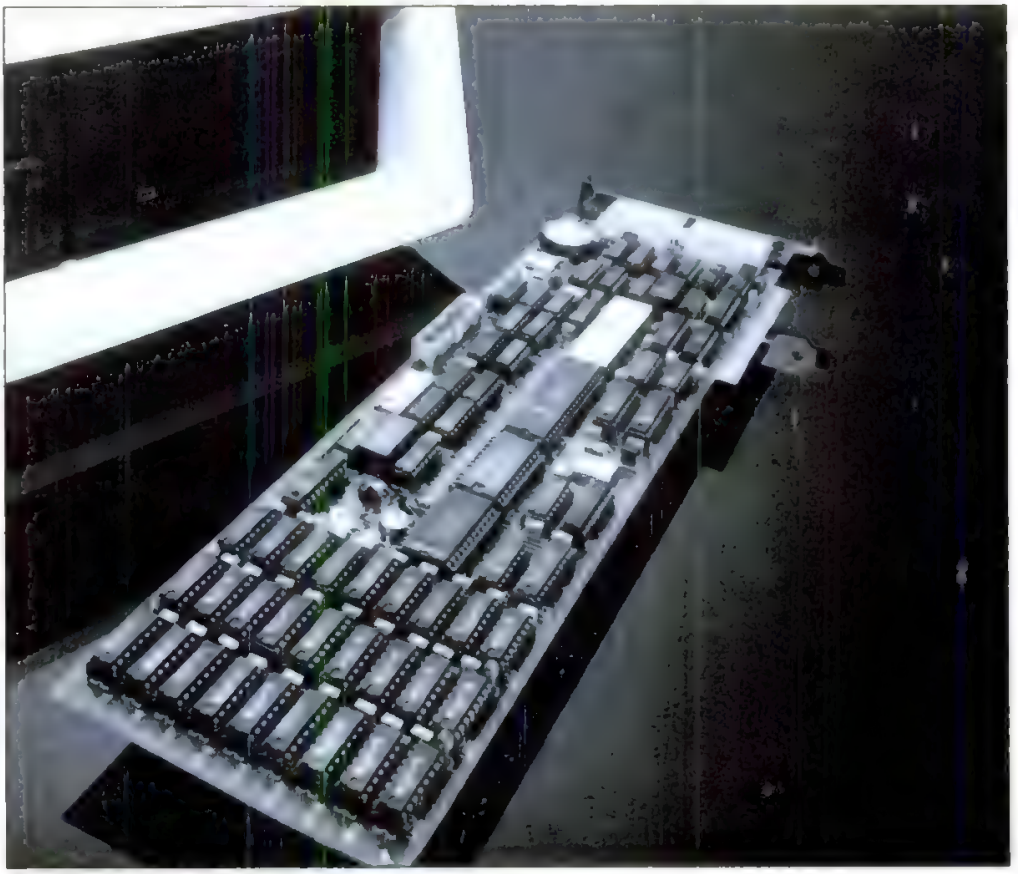
CIRCLE 794 ON READER SERVICE CARD

SOFTWARE

SPELLIX

A spelling-checker program with a dictionary of 43,000 words, plus the ability to store 4,000 additional, user-defined words. The program highlights a questionable word in reverse video as a document scrolls on the screen. Users may ignore the highlight if the word is correctly spelled, add it to the user's own dictionary, add it to a temporary dictionary for the current run only, request suggested corrections, or type a correction.

In typing a correction, *SPELLIX* allows expanded editing beyond the word itself, up to a total of 10 lines of the display.



PC eXTender, Falcon Technology, Inc.

Business Decision.

Let's be honest.

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And information stored in one of these packages would rarely fit into another without a lot of trouble.

This means you had to spend your valuable time pushing buttons and learning to become a computer expert.

Instead of using the personal computer as a tool for business decisions.

Not exactly a shining moment in the personal computer revolution.

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The Context MBA is software for the IBM PC, PC-XT, and Hewlett-Packard Series 200 personal computers that combines all the functions you'll ever need - spreadsheet, information management, report writing, graphics, and communications - into a single, easy-to-use package.

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Sort, search, update, and store this information in your personal computer. Analyze it, prepare sales forecasts or study new business opportunities in minutes, instead of hours.

While you're using the spreadsheet, use the MBA's graphics function to make spreadsheet figures come alive on your screen in charts or graphs. So you can visualize the effect of possible changes to your business.

This year, or five years from now. Instantly.

When you've made sense out of the possibilities, use the MBA's full-function executive report writer to put these words, numbers, and graphs into a finished, printed report.

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CONTEXT MANAGEMENT SYSTEMS
23868 Hawthorne Blvd.
Torrance, CA 90505
(213) 378-8277

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CIRCLE 105 ON READER SERVICE CARD

(List Price: $95)
Requires: 128K, two disk drives, PC-DOS.
Emerging Technology Consultants, Inc.
2031 Broadway
Boulder, CO 80302
(303) 447-9495

CIRCLE 735 ON READER SERVICE CARD

PC Speak

A program providing visually handicapped users with a means to access their systems. *PC Speak*, used with a speech synthesizer board, converts a display screen into audible output. The user can select to have the entire display read, or can select words or lines to be read using the cursor control keys. Users can also supply different pronunciations for punctuation marks and special symbols to be used in different environments. For example, in a spreadsheet program a decimal point could be pronounced "point," while in a word processing application, the same symbol could be "period."
(List Price: $395)
Requires: *64K, one disk drive, PC-DOS, parallel or serial port, speech synthesizer.*
Solutions By Example, Inc.
Box 307
New Town Branch
Boston, MA 02258
(617) 244-5880

CIRCLE 782 ON READER SERVICE CARD

Managing Your Business

A series of interactive tutorials teaching various applications of spreadsheet programs such as Lotus *1-2-3*, *Multiplan*, *VisiCalc*, and *SuperCalc* for the user's business. Each tutorial provides training and tools that allow the user to analyze various aspects of business management. These tools include sales forecasting, product margins, budgeting, cash flow, materials requirement planning, accounts receivable and payable, and return on equity analysis.
(List Price: $69.95)
Requires: 64K, one disk drive, PC-DOS.
Cdex Corp.
5050 El Camino Real, #200
Los Altos, CA 94022
(415) 964-7600

CIRCLE 733 ON READER SERVICE CARD

P-Comm 3.0

A communications program written in Pascal for users of the UCSD p-System operating system. The program emulates asynchronous terminals, allowing communications and data transfers between systems with the same or differing operating systems and disk formats. *P-Comm* can establish communications automatically and can operate under a variety of protocols, including the XMODEM error-correcting system.

The software maintains a phone directory, allowing users to place calls and log onto commercial databases, for example, with a single keystroke. The program sets the appropriate communications parameters automatically. Other features of *P-Comm* include the ability to transfer files at speeds up to 9600 baud, and to receive files at up to 2400 baud; XON/XOFF protocol, as well as XMODEM and "Pacing" protocols; and full or half duplex operations. The software is designed to use the commands of the Hayes Smartmodem, but can be used as well with other types of modems.
(List Price: $95)
Requires: 64K, one disk drive, UCSD p-System (NCI IV.1 version), asynchronous communications adapter.
Ergosoft
7122 Cather Ct.
San Diego, CA 92122

CIRCLE 732 ON READER SERVICE CARD

ReadiScope

A disk diagnostic and alignment program, allowing the user to check the alignment and operation of a floppy disk drive while it remains installed in the user's system. The program uses a specially recorded diagnostic diskette and reports its results in a graph format on the display.

Adjustments to head and spindle hub alignment can be made without requiring special equipment, skills or knowledge. *ReadiScope's* functions allow the complete testing of a drive, including head alignment, rotation speed, spindle rotation tracking, and azimuth rotation. The program also analyzes the performance of the diskette read/write heads.

Tests are performed in approximately 30 seconds, allowing for periodic checks to be performed easily.
(List Price: $295)
Requires: 64K, one disk drive, PC-DOS, monitor.
ReadiWare Systems, Inc.
P.O. Box 680
W. Redding, CT 06896
(203) 431-3521

CIRCLE 731 ON READER SERVICE CARD

The Assistant Accountant Series

A series of accounting programs, written in dBASE II and including source code allowing users to modify programs as needed. Programs available in the series include *General Ledger, Financial Reporting, Accounts Receivable, Accounts Payable, Professional Time and Invoicing, Job Costing, Payroll, Professional Staff Scheduling, Tournament Golf Scheduling, and Golf Handicapping*.

The programs are menu-driven, with error-checking routines.
(List Price: $550 each)

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(714) 669-0774

CIRCLE 141 ON READER SERVICE CARD

Requires: 96K, one 320K or two 160K drives, PC-DOS, monitor, dBASE II.
Lake Avenue Software
77 N. Oak Knoll, #105
Pasadena, CA 91101
(213) 792-1881

CIRCLE 730 ON READER SERVICE CARD

Screen Copy

A screen dump program which will transfer any screen image to a printer with the use of the PrtSc key. It operates independent of the application being run, and can print every one of the 256 characters capable of being displayed, including foreign language characters, line drawing graphics, and miscellaneous symbols.

Screen Copy can print characters double-width if the screen is in 40-column mode; line spacing can be altered at will; and graphics can be reproduced vertically full-sized, or horizontally and reduced. Supported printers include Epsons with Graftrax, NEC 8023A, and C. Itoh Prowriters.
(List Price: $49.95)
Requires: 64K, one disk drive, color or monochrome monitor, color/graphics adapter, supported printer.
Compu-Systems
209 Castillon Way
San Jose, CA 95119
(408) 578-7321

CIRCLE 729 ON READER SERVICE CARD

OfficeWriter

A word processing program featuring ease of use and single key initiation of functions. Features of the program include basic document editing, document merge, headers and footers, pagination, and text transfer between documents.

Advanced features of *OfficeWriter* include dynamic screen formatting, which constantly adjusts the displayed text to appear as it will print; and context-sensitive help screens to provide information specific to the function being performed. The program currently supports 23 printers, and a variety of print options.
(List Price: $325)
Requires: 128K, two disk drives, PC-DOS 1.1 or 2.0, monitor, printer.
Office Solutions, Inc.
P.O. Box 5146
Madison, WI 53705
(608) 274-5047

CIRCLE 728 ON READER SERVICE CARD

Cursor Graphics

A graphics program suitable for non-programmers or professionals. The program creates graphics with cursor movements and commands. *Cursor Graphics* automatically generates compact BASIC code using LINE, DRAW, CIRCLE, PAINT, and COLOR statements. Shapes may be added from templates, and erasures and modifications to graphics can be readily made. Text of variable size may be placed anywhere on a screen.

Cursor Graphics allows graphic screen images to be saved in any of four ways: as a BASIC routine, as hard copy (a screen dump for the Epson printer is included), as a binary file of the full screen, or as a partial screen template.
(List Price: $20)
Requires: 64K, one disk drive, PC-DOS, monitor, color/graphics adapter, Epson printer.
Supernova Software
P.O. Box 2101
Halifax, NS
Canada, B3J 3B7

CIRCLE 727 ON READER SERVICE CARD

LIST Text & Data Formatter

A utility program offering a range of options to control the format of data output. Input file selection may be by file specification, with or without global characters, or by date. Formatted output may be directed to printers, displays, disk files, or communications lines in text or hexidecimal modes.

LIST format options include page length, left and right margin control, line spacing, line numbering, page numbering, headers, footers, range of ASCII codes to output, backspace choices, form feed choices, and others. The utility interprets tabs and returns, allows for selected partial output of a file, and provides a means to send initialization data to an output device before sending formatted data.
(List Price: $29.95)
Requires: 64K, one disk drive, PC-DOS.
Abacus Programming Corp.
14545 Victory Blvd., #300
Van Nuys, CA 91411
(213) 785-8000

CIRCLE 726 ON READER SERVICE CARD

DataFiler

A database management program allowing data files with as many as 45 items per record. *DataFiler* allows the user to assign up to ten key phrases to the function keys to simplify data entry. Records can be selected through up to five selection criteria. Sorting of selected records can be as many as three levels deep.

The user may specify up to nine report formats for each file, and reserve up to 512 characters for comments or other textual material. Menu options eliminate the need to learn complex commands, and the program incorporates sub-menus at the end of each major program component to eliminate the need to return to the master menu after each function.
(List Price: $225)
Requires: 128K, two 320K drives, PC-DOS, monitor, printer.

MBS Software
12729 N.E. Hassalo St.
Portland, OR 97230
(503) 256-0130

CIRCLE 725 ON READER SERVICE CARD

BLINK Library Linker

A preprocessor utility that links BASIC subroutines from a library to an application program for use with BASIC interpreters. Libraries may be of purchased routines or developed by the user.

BLINK directives in the program refer to library subroutines by name rather than by line number. The utility adds only those subroutines referenced and converts the references to proper GOSUB statements. The directives also provide for the inclusion of blocks of code from the library in one or more locations in the application program.

Remarks inserted by *BLINK* contain the subroutine and include block names to make debugging and reading the code easier.
(List Price: $29.95)
Requires: 64K, one disk drive, PC-DOS, BASIC or BASICA Interpreter.
Abacus Programming Corp.
1455 Victory Blvd., #300
Van Nuys, CA 91411
(213) 785-8000

CIRCLE 724 ON READER SERVICE CARD

The Tax Depletion Program

An oil and gas tax program which provides complete depletion calculation on a property-by-property basis. This *MCM Tax Series* release includes features such as cost and statutory depletion; 50% net income limitation calculations and allocation of the 65% limitation to properties; net income from oil and gas revenues, preference IDC, and allocation of overhead to properties; sorting of information required for state tax calculations; and the preparation of schedules which can be attached to a user's Federal income tax returns.
(List Price: $1,750)
Requires: 128K, two 320K drives, PC-DOS.
MCM Systems, Inc.
2706 Richmond, #100
Houston, TX 77098
(713) 522-1700

CIRCLE 723 ON READER SERVICE CARD

DataStar & ReportStar Tutorials

Two interactive tutorials in the use of the *DataStar* and *ReportStar* programs. Each tutorial includes a two-diskette training program and a 50-page handbook with exercises, a reference section, and sample applications.

All principal procedures in both *DataStar* and *ReportStar* programs are explained, including the more advanced procedures such as the use of key fields, resorting data files, and using logical expressions. The sample applications describe how the two programs can be applied to business sales analysis, academic and professional research, professional billing on preprinted forms, keeping track of itemized tax deductions, high volume transaction processing, and other applications.
(List Price: $59.95 each)
Requires: 64K, two disk drives, PC-DOS, DataStar or ReportStar.
Witech Corp.
763 Vallejo Way
Sacramento, CA 95818
(916) 441-7772

CIRCLE 721 ON READER SERVICE CARD

The Individual Tax Program

A tax estimation program for 1983 tax planning. This release in the *MCM Tax Series* allows users to evaluate the effects of different tax strategies and investment alternatives on tax liability. *The Individual Tax Program* calculates tax liabilities using IRS tables and rate schedules for standard, income averaging, and alternative minimum tax methods of calculation.
(List Price: $189)
Requires: 128K, one disk drive, PC-DOS.
MCM Systems, Inc.
2706 Richmond, #100
Houston, TX 77011
(713) 522-1700

CIRCLE 722 ON READER SERVICE CARD

dPROGRAMMER

An applications generating program for users of *dBASE II* database management software. The program provides a method for developing debugged, ready-to-use applications quickly. It constructs data files and formatting information on-screen, allowing data to be entered as required by the user. Retrieval and use of data is provided by an imposed menu-driven structure, including functions to list data on the screen in a predefined format, reports to be sent to a printer, and the retrieval of individual records.

All of *dPROGRAMMER's* functions are directly accessible through menus which are defined by the user through a question and answer format.

The *dPROGRAMMER* package includes an integrated accounting program. This module can handle all standard general ledger functions, including the preparation of balance sheet and income statement reports. The module is furnished with its *dBASE II* source code, allowing users to incorporate the accounting functions with other applications.
(List Price: $295)
Requires: 64K, one 320K drive, PC-DOS, *dBASE II*.

Sensible Designs
5244 Edgepark Way
San Diego, CA 92124
(619) 560-4583

CIRCLE 720 ON READER SERVICE CARD

The Individual Tax Planner

A professionally-oriented program for tax planning practitioners. *The Individual Tax Planner, U.S. Income Series*, can automatically compute new tax liabilities for 1983 through 1987, for all categories of individuals and fiduciaries. It can also compute lump-sum distribution and provide indexing of Federal rate schedules, tables, zero bracket amounts, and exemptions for post-1984 years.

The software uses a spreadsheet format for ease of data entry. Multiple year or multiple case projections can be performed simultaneously, and variables can be changed with instant recalculation of tax liabilities. The multi-level worksheets permit entry of as much detail as needed in a flexible format. Instant access to supporting worksheets and schedules is provided, and worksheets show interim results as data is entered. "Help" messages, with references to appropriate IRS code, are displayed as needed throughout the run of the program.
(List Price: $595)

Individual Tax Planner, *Tax Management Inc.*

Requires: *PC-DOS 1.1:128K; PC-DOS 2.0:192K; two 320K drives.*
Tax Management Inc.
1231 25th St., N.W.
Washington, DC 20037
(800) 373-1033
(800) 352-1400 in Maryland
(202) 248 4405

CIRCLE 774 ON READER SERVICE CARD

MAG/base Series

Three versions of the *MAG/base* database management system, geared for users of varying sophistication from entry level to professional. All files and functions are transportable from one level to the next. The three versions all provide databases with up to 99 keys, 999 fields per record, and up to 999,999 records per file.

MAG/base[1] enables the first-time user to create databases, add, change, and delete information by any key, and to produce reports, generate forms, and print multiple labels and personalized letters. *MAG/base*[2], designed for business users, provides more sophisticated report facilities, multiple files, and calculations. It encompasses all *MAG/base*[1] features plus a relational report writer. Up to five files can be combined in a single report, and calculations can have up to nine levels of subtotals and 14 digits.

MAG/base[3] includes all of the functions of the first two programs, and adds an interface that opens the system to external application programs, password protec-

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- Microrim R:Base . . . $275
- MicroPro InfoStar
- And others

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  - Wordstar professional pack . . . $345
  - WordStar 3.3 . . . $240
- Microsoft
  - Word w/Mouse . . . $359
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CIRCLE 466 ON READER SERVICE CARD

tion, menu definition, and extended screen management facilities.
(List Price: MAG/base[1] $295; MAG/base[2] $495; MAG/base[3] $795)
Requires: All versions: 128K, two 320K drives or hard disk, PC-DOS.
MAG Software, Inc.
21054 Sherman Way, #305
Canoga Park, CA 91303
(213) 883-DBMS

CIRCLE 790 ON READER SERVICE CARD.

MULTIREG

A menu-driven, file-oriented multiple regression program which includes on-line instructions and examples of data structures. Files can contain any number of independent and dependent variables, any subset of which can be analyzed. Variables may be named, and files can be appended, edited, transformed and printed.

MULTIREG calculates a least-squares linear regression for two or three independent variables. Output includes the means and standard deviations of all variables, the correlation matrix, the standard partial regression coefficients, the prediction equation, the coefficient of multiple determination (R^2), an anova-type variance table, and the F-value for Ho: $R^2 = 0$.
(List Price: $30)
Requires: 64K, one disk drive, PC-DOS.
Science Software
RFD 2, Box 63
Nelsonville, OH 45764
(614) 753-1397

CIRCLE 789 ON READER SERVICE CARD

STAT-PAK Utilities

Two menu-driven programs that increase the usefulness of the *STAT-PAK* statistical analysis program. *HISTO-PAK* prints histograms of any *STAT-PAK* data file or subcategory within a data file. Histograms can contain one or two variables and include a title, legend, and labels for each axis. *FILE-PAK* converts Data Interchange Format (DIF) files from spreadsheet and database software to the *STAT-PAK* file format. Converted files may then be processed by any *STAT-PAK* statistical procedure. *STAT-PAK* files may also be converted to DIF files.
(List Price: $30)
Requires: 64K, one disk drive, PC-DOS, printer, *STAT-PAK*.
Science Software
RFD 2, Box 63
Nelsonville, OH 45764
(614) 753-1397

CIRCLE 788 ON READER SERVICE CARD

REGRESSION PLUS

A linear least-squares regression program for solving scientific and engineering problems. The program is written in assembly language, and is designed to take advantage of the mathematical computation capability of the Intel 8087 Math Co-processor chip.

REGRESSION PLUS can handle weighted least squares, constrained coeefficients, and polynomial fits, as well as simultaneous equations inverses. Modified Gram-Schmidt decomposition and extended precision provide numerical stability and computational accuracy. The program can detect ill-conditioned systems of equations.

A separate data entry program is provided to facilitate data editing and transformations.
(List Price: $695)
Requires: 192K, one disk drive, PC-DOS 2.0, 8087 Math Co-Processor.
SourceWare
1400 E. 55th Pl., # 512
Chicago, IL 60637
(312) 955-4539

CIRCLE 787 ON READER SERVICE CARD

EXEC-I

A program consisting of seven different applications, all of which use the same set of commands for data entry, display, summary, and reports. The applications include: *MAILING LIST*, a file of names, addresses, and phone numbers, which can produce labels and list reports; *LETTER/MEMO*, for printing memos and simple letters; *RECORD/INVENTORY*, a method of keeping track of personal records and/or inventory; *CHECK MANAGEMENT*, for keeping track of checking accounts, using a tax code to classify checks for income tax purposes; *STOCK SECURITY*, to keep track of personal stock portfolios, dividends, and current selling prices; *PERSONAL FINANCE*, providing a means to classify and keep track of personal assets such as incomes, bank accounts, real property, stocks, expenses, loans, etc.; and *APPOINTMENT MANAGEMENT*, an automated appointments calendar.

The software is written using the IDM-X database management system, and data entry follows a fill-in-the-forms approach. *EXEC-I* includes a sort/merge facility and is compatible with other software packages, including the manufacturer's database manager and word processing system.

Two versions of *EXEC-I* are currently available: an interpreted version for systems with 64K RAM, and a compiled version for systems with 128K or more.
(List Price: Both versions $198 each; demo disk $10)
Requires: 64K, two disk drives, PC-DOS.
Micro Architect, Inc.
6 Great Pines Ave.
Burlington, MA 01803
(617) 273-5658

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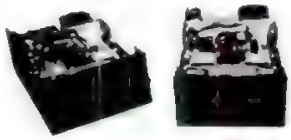

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CIRCLE 362 ON READER SERVICE CARD

Depreciation Utility

A program which prepares and lists depreciation tables for five different depreciation methods—straight line, declining balance, double declining balance, sum of years digits, and accelerated cost recovery system. The program is menu driven, and provides prompts for all required information, including cost, life of asset, salvage value, etc.

Three first-period conventions—full-period depreciation, half-period depreciation, or zero depreciation—are allowed in the calculation of depreciation expense. On-line instructions are built into the program to explain the use and description of the program.

(List Price: $29.95)

Requires: 32K, one disk drive, PC-DOS.

Grovetown Software Co.
1335 Old Louisville Rd.
Grovetown, GA 30813
(404) 556-6325

CIRCLE 786 ON READER SERVICE CARD

BRANVID

A program specifically for video rental businesses, providing a means to maintain track of inventory of stocked films as well as membership rolls. *BRANVID* lists movie titles by categories such as comedy, western, science fiction, drama, musical, etc. Member files give status of member's account, expiration, video format owned, number of films checked out, etc. Management reports feature QWIKSTATS which summarize such daily activity as the number of charge-outs and check-ins, number of new titles, and new members.

The program, written in *dBASE II*, also produces more comprehensive reports, which can compare check-outs of various titles over a three-month, six-month, and nine-month period. Listings of overdue titles, printed with the member's phone number, allows the user to keep track of delinquencies. Optional passwords lock unauthorized personnel from accessing sensitive data.

(List Price: $700)

Requires: 64K, two disk drives, PC-DOS, *dBASE II* Run-Time module (included in base price).

John D. Owens Assoc., Inc.
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Staten Island, NY 10305
(212) 448-6298
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VIZ-Escape 2.0

A new release of the *VIZ-Escape* utility program for *VisiCalc* users. *VIZ-Escape* allows users of the *Interactive Financial Planning System* to use *VisiCalc* to create and edit *IFPS* files. Users create a model using *VisiCalc*: once the spreadsheet has been updated, it is saved on diskette. This file is then used by *VIZ-Escape* to generate an *IFPS* data file. Communications software can then be used to upload the data file to IBM TSO or CMS mainframes for subsequent consolidation with an *IFPS* system.

(List Price: $800; current VIZ-Escape users can upgrade for $25 plus the return of their version 1.1 diskettes)

Requires: 96K, two disk drives, PC-DOS, *VisiCalc*.

Clarity Corp.
11103 Spicewood Pkwy.
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Printer control features include multiple fonts, boldface, double-wide and double-high/double-wide characters, super- and subscript, single and double underlining, and selection of colors. The *Leading Edge Word Processor* also permits printing to be done as text files are being edited, copying files as they are printed, or performing other editing functions simultaneously.

Special features of the software include split screens, allowing review of more than one document at a time on the same display; special place markers allowing quick return to specific locations within text; change case commands, permitting characters to be changed from upper to lower case, or the reverse, without needing to retype text; and a "Go To Page —" command for rapid access to any page within a document.

(List Price: under $300)

Requires: 128K, two disk drives, PC-DOS.

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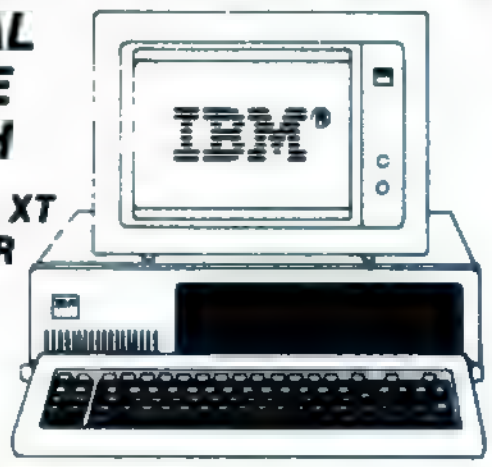

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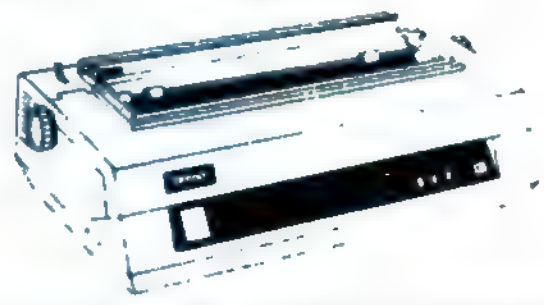

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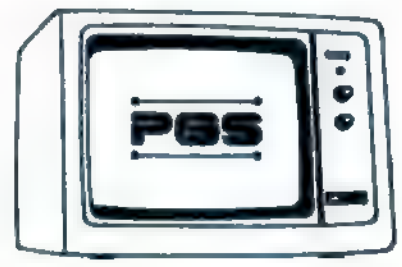

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(List Price: $79)
Requires: *65K (PC-DOS 1.1) or 96K (PC-DOS 2.0), one disk drive, printer.*
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P.O. Box 14097
Tulsa, OK 74104
(918) 747-0151

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The *Policy Replacement Illustrator* program includes an on-screen report for use prior to printing out a hard copy report. Hard copy shows advisor's and client's names, pertinent policy data (premium, face amount, ADB, waiver), age at end of period, and current age.
(List Price: $19.95)
Requires: *64K, one disk drive, PC-DOS, 80-col. printer.*
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System Sidekick, LinTek, Inc.

Ten Little Robots

A game program for children ages two to seven years. The software contains five separate learning games, including *Little Robot Story*, an interactive nursery story introducing the child to the concept of subtraction and preparing him/her for reading readiness; *Robot Letter Match*, in which the child chooses matching letters in upper or lower case; *Count the Robots*, an exercise in counting skills; *Robot Addition*, providing simple addition problems; and *Robot Sketch*, a creative graphics program.
(List Price: $39.95)
Requires: *64K, one disk drive, PC-DOS, color monitor, color/graphics adapter.*
Unicorn Software
1775 E. Tropicana Ave.
Las Vegas, NV 89109
(702) 798-2727

CIRCLE 776 ON READER SERVICE CARD

ACCESSORIES

System Sidekick

A desk-mounted support stand for the systems unit which holds the unit vertically to one side of a user's desk. System Sidekick frees up work space on the desk, while keeping the system unit close at hand.

The device features all steel construction, and consists of an off-white, urethane coated mounting plate

and two vinyl-coated, scratch resistant support brackets. It comes with a standard clamp mounting, and is available with screw mounts for deskside and under-the-table mounting.
(List Price: $79.95)
LinTek Inc.
P.O. Box 8056
Grand Rapids, MI 49508
(616) 241-4040

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IBM Keyboard Templates

A line of templates that fit over a user's IBM PC keyboard, showing commands for a variety of commercially available software. Templates are available for Lotus *1-2-3*, *WordStar*, *VisiCalc*, *dBASE II*, *SuperCalc*, *SuperCalc2*, and *EasyWriter II*.
(List Price: $19.95-$32.95, depending upon program and style)
Creative Products
P.O. Box 85152-MB134
San Diego, CA 92138
(800) 231-5413
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CIRCLE 753 ON READER SERVICE CARD

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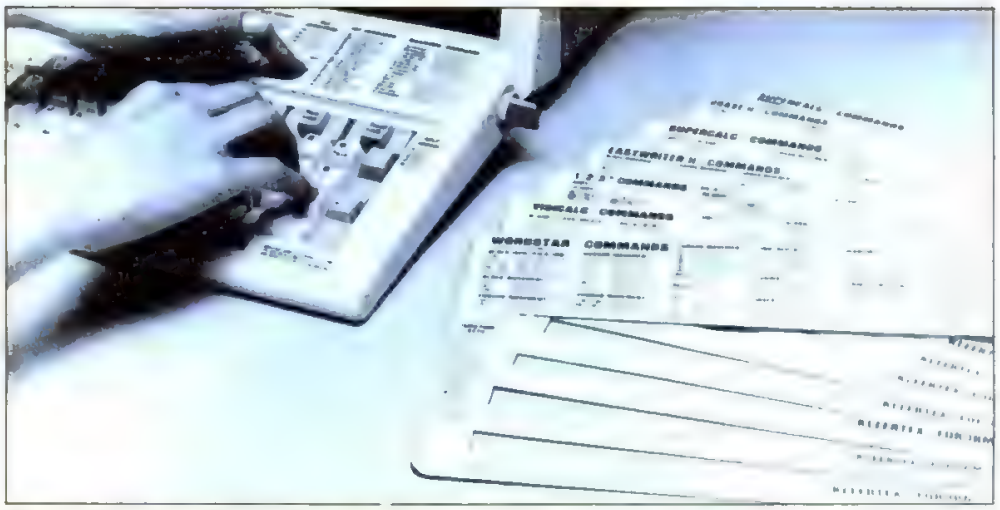

***Keyboard Templates**, Creative Products*

***Computer Covers**, Designs In Fabric, Inc.*

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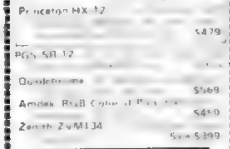
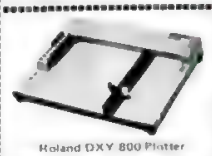
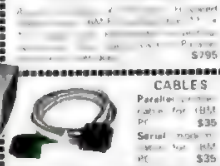


**** GREEN SCREEN ****

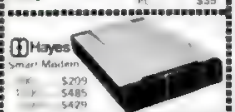
**** AMBER SCREEN ****



Roland DXY 800 Plotter



CABLES



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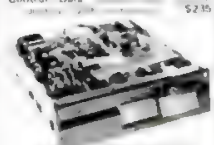

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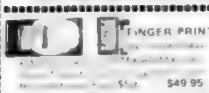

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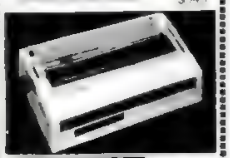

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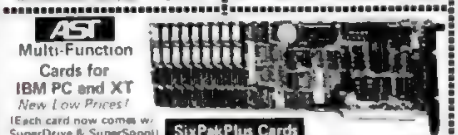

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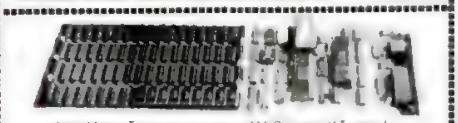

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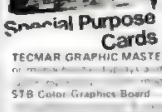

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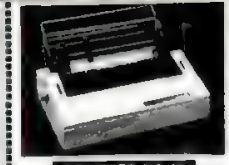

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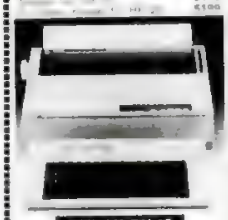

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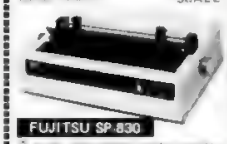

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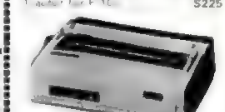
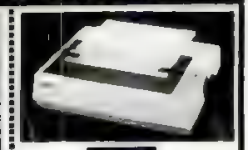


TRANSTAR 130P $689



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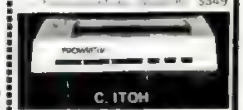

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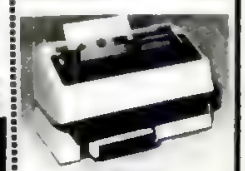

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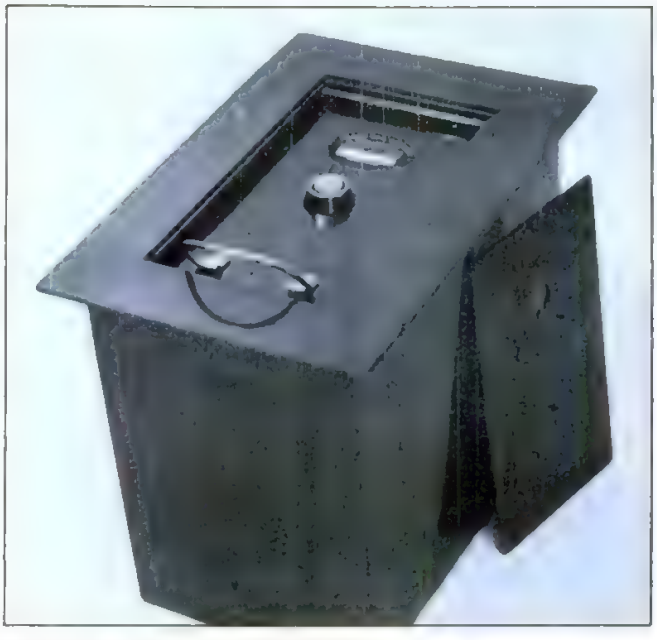

***High Security Boxes**, Hadon Security Corp.*

***25 Pack**, Beck Manufacturing*

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An optional keyboard drawer can be mounted under the desk top, in the center or to either side.

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A desktop workstation unit, placing a user's system components in a comfortable configuration. The INLINE Data Station provides a slanted document surface designed to hold work at an appropriate viewing angle, positioned in line with the keyboard and display screen.

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***The Woodbury Series**, FineTech Furniture, Inc.*

***INLINE Data Entry Station**, Pentek Products, Inc.*

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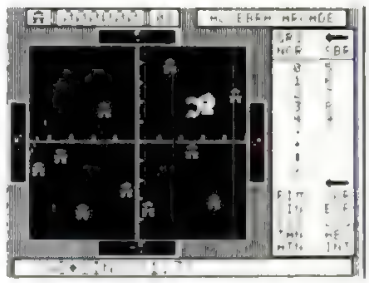

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CIRCLE 186 ON READER SERVICE CARD

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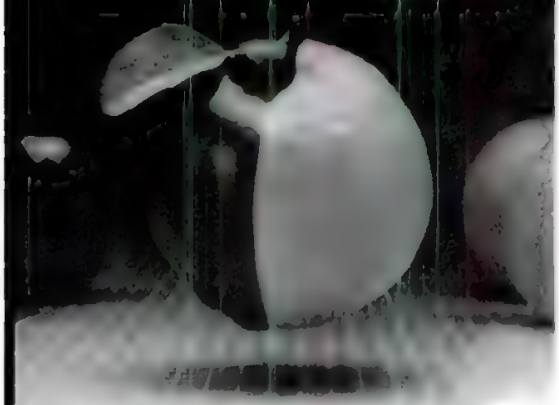

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SOURCE

C Source
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Until now, IBM BASIC and C were about as far apart as apples and oranges — and if you wanted to move from BASIC to C, you had to go back to square one. Not anymore!

There's no denying that BASIC is a fine language: it has probably helped you learn a lot about programming computers. But now that you know how to program, isn't it time to take the next step — to a language that was designed to help you quickly develop software that is fast, compact, and portable?

BASIC_C can help you make the transition smoothly: it's a library of C functions providing BASIC's high level capabilities you've come to know so well. Functions for string handling, sequential and random i/o, graphics, and many more — all designed to look and work like BASIC.

You get the source code to BASIC_C: extensively documented, it provides many examples to help you learn how to write C functions, and if a function doesn't suit your specific needs . . . change it!

C Source provides a complete development package: the BASIC_C Library, a full screen editor, and a choice of two C compilers. Buy it all, or just the pieces you need.

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EC - full screen editor	$ 85
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BASIC_C & Computer Innovations C compiler	$475
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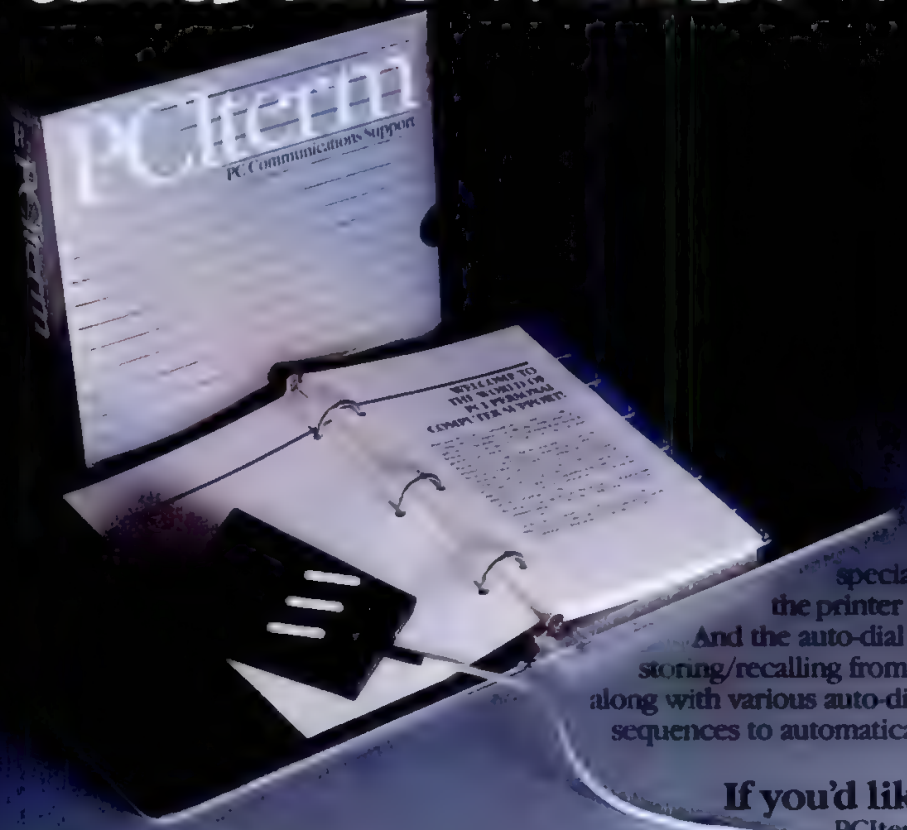
The tale of the mouse and the window (cont'd).



redundant keystroke entries. There's a facility for sending special printer control codes through the printer communications port of your PC. And the auto-dial feature provides a facility for storing/recalling from the diskette telephone numbers along with various auto-dial modem control/set-up sequences to automatically dial-up host computers.

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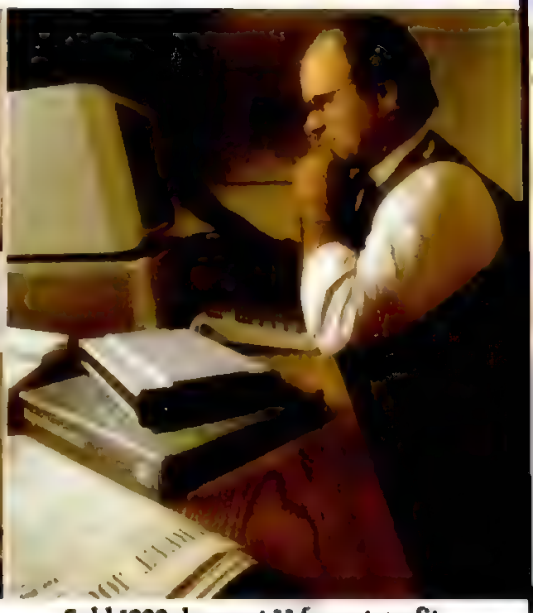

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EDITED BY PAUL SOMERSON

User-To-User

PC readers help one another by passing along their persistent problems, inspired comments, and helpful solutions.

Number Base Conversions

There are many times when it would be useful to convert numbers from one base to another. I'm a number theorist who has developed a program called CONVERT (see Figure 1) that does just this. The program is self-prompting and works on any bases from 2 to 36.

Terry D. Lundgren
Mesa, Arizona

This does seem to do the trick. It's handy for converting odd-based numbers to binary or hex or decimal and back. We've already found several uses for it around the office.

DOS Incompatibility

I have discovered a slight incompatibility between DOS 1.1 and DOS 2.0. There are times in our office when we need to copy a file that was created using DOS 2.0 onto a disk for use by another IBM PC that uses DOS 1.1. When I used the CHKDSK command on this disk on the IBM PC using DOS 1.1, I discovered that the file that was copied using DOS 2.0 onto this disk is listed as a hidden file by CHKDSK. In all other respects, though, this file is treated as a nonhidden file (that is, it can be listed by a DIR command, edited by EDLIN, accessed by a program, and so forth).

Michael Roberts
Woodinville, Washington

This does, indeed, seem like a bug. Contributing Editor Stephen Manes also discovered this late one night and was ready to toss his system out the window. There are many other 2.0-to-1.1 problems. At least this one doesn't destroy files.

Manes puts it this way: "What I finally figured out was that DOS 2.0 isn't hiding files as far as it's concerned. In the DOS directory there's something called the file attribute byte. Depending on the value of this byte, DOS considers the file hidden, system, read-only, silly, not-to-be-taken seriously, or whatever.

"When you open and close a file, DOS 2.0 sets what it calls an archive bit within this attribute byte. As far as I can tell, this attribute bit mostly lets DOS keep track of

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which files it hasn't backed up from hard disk via the BACKUP function. So far this bit is less than useless with files on floppies, but it insists on setting this bit on them anyway.

"DOS 1.1, alas, never heard of the attribute bit. When it sees a file with that bit set, it decides that something isn't quite normal about it. What it decides is wrong seems to depend on which function it's using. CHKDSK considers the file to be hidden, but DIR will let you list it, and you should be able to copy it normally.

"In practice, I found the goofy CHKDSK message to be the main problem, but I'm sure there could be others. I finally got so sick of the whole stupid business I switched to using DOS 2.0 permanently."

And Manes is now discovering a few amazing things about DOS 2.0 that can help the rest of us. Here's his latest find:

No More Insertion Problems!

When I switched to DOS 2.0 from DOS 1.1, the one thing that kept infuriating me was how often DOS insisted that I "Insert COMMAND.COM disk in Drive A". Invariably, I'd slap a disk in the drive and get that damnable message "Invalid COMMAND.COM"—translation: that's a 1.1 disk, you jerk!

Of course, you can just copy the DOS 2.0 COMMAND.COM onto any old COMMAND.COM disk, but if the DOS 1.1 system files are on it and you happen to boot from that disk, you will create a "mixed system" that has the potential to do very unpleasant things to your files

```
100 ' Convert -- (c) 1983 Terry D. Lundgren; adapted by PC Magazine
110 '
120 KEY OFF:CLS:DEFSTR A-F:DEFINT I-N
130 PRINT TAB(22);CHR$(42);STRING$(35,61);CHR$(42)
140 PRINT TAB(22);CHR$(124);" Number base conversion calculator ";CHR$(124)
150 PRINT TAB(22);CHR$(42);STRING$(35,61);CHR$(42)
160 PRINT
170 PRINT SPC(2);"Convert numbers from one to another base (2 - 36).";
180 PRINT SPC(2);"The standard convention"
190 PRINT SPC(2);"of A, B, C, ... is used";
200 PRINT CHR$(32);"for representation of numbers greater than 10 with"
210 PRINT SPC(2);"bases greater than 10.  Enter values as prompted.  Enter 0";
220 PRINT CHR$(32);"(zero) as input"
230 PRINT SPC(2);"base to end program."
240 PRINT
250 PRINT TAB(20);"BASE";TAB(47);"NUMBERS"
260 PRINT TAB(15);STRING$(46,61)
270 PRINT TAB(15);"Input";SPC(2);"Output";TAB(40);"Input";TAB(55);"Output"
280 PRINT TAB(14);
290 INPUT;"  ",IB:IF IB<2 THEN END
300 PRINT TAB(24);:INPUT;"",IOB
310 PRINT TAB(40);:INPUT;"",BV
320 FOR K=1 TO LEN(BV)
330 IF ASC(MID$(BV,K,1))>96 AND ASC(MID$(BV,K,1))<123 THEN 340 ELSE 350
340 MID$(BV,K,1)=CHR$(ASC(MID$(BV,K,1)) AND 95)
350 NEXT
360 XBV=0
370 FOR I=1 TO LEN(BV)
380 BVT=MID$(BV,LEN(BV)-I+1,1)
390 MULT=ASC(BVT)-55
400 IF VAL(BVT)>0 OR BVT="0" THEN MULT=VAL(BVT)
410 XBV=XBV+MULT*IB^(I-1)
420 NEXT I
430 BV=""
440 FOR I=1 TO 25
450 IF XBV<IOB^I THEN 480 ELSE NEXT I
460 PRINT SPC(3);"Overflow; change line 440"
470 STOP
480 FOR J=I TO 1 STEP -1
490 TEMP=FIX(XBV/(IOB^(J-1)))
500 XBV=XBV-TEMP*IOB^(J-1)
510 BVT=MID$(STR$(TEMP),2)
520 IF TEMP>9 THEN BVT=CHR$(TEMP+55)
530 BV=BV+BVT
540 NEXT J
550 PRINT TAB(55);BV
560 GOTO 280
```

Figure 1: *Number Base Conversion Program.*

before you discover them. The solution is to copy all the files to a DOS 2.0 COMMAND.COM disk via the COPY *.* method. That's a colossal bore.

Since I don't own an XT, but run a fake disk as drive C, I wanted a way to make DOS look there instead of drive A for COMMAND.COM—which I would then leave on drive C all day. Then, while leafing through the DOS 2.0 manual in search of some piece of arcana, I discovered the information I'd been looking for.

DOS 2.0 lets you invoke a "secondary command processor" that takes over from the original COMMAND.COM. All you have to do is tell DOS where this new surrogate is and what it's called, and DOS will do the rest. The format is:

```
COMMAND [d:] [path] [/P]
        [/C doscommand]
```

The d: and path are the drive and path get DOS to the directory where the new COMMAND.COM is located. The /C doscommand is supposed to let you call a DOS function after the switch. It seems to work with some DOS commands (like DIR) but doesn't with others (like PATH).

That leaves /P, which is supposed to make the new COMMAND.COM "permanent" in RAM—or as permanent as anything ever gets in RAM. In theory this would be neat, since DOS wouldn't have to look to any disk to reload its transient portion. But though the /P switch does eat up slightly more memory than the command without the /P (either way, it's less than 4K) DOS still demands COMMAND.COM on disk. Beats me.

The way you do what I wanted to is simply to put COMMAND.COM on drive C: and type

```
COMMAND C:\
```

Not only does it solve the problem, but it avoids yet one more annoying clunk from the disk drive.

You can do it from a batch file, but make sure it's the last command in the file. The original version of COMMAND.COM is the part of DOS that remembers where your batch file was. The minute you invoke a new COMMAND.COM, it takes command; since it's ignorant of all batch files, your original batch file quits. So does the PATH you've declared to the original COMMAND.COM. You'll have to set it all over again. But it's worth it to be rid of those infuriating "insert!" messages. Just one caution: don't erase COMMAND.COM from your fake disk, or you will have to reboot the whole system.

If you want to go back to the original command processor, type EXIT from the DOS prompt and the original COMMAND.COM will reawaken—and continue any batch file that may have been in effect. If you want to see what's currently in effect, type SET. DOS will tell you your current PATH and, as COMSPEC, where it's currently hunting for COMMAND.COM when it needs it.

You'll find the info tucked away on page 10-9 of the DOS 2.0 manual. The explanation there seems to be just the tip of a potentially large iceberg. Too bad it's not anywhere to be found in the index.

Stephen Manes
Riverdale, NY

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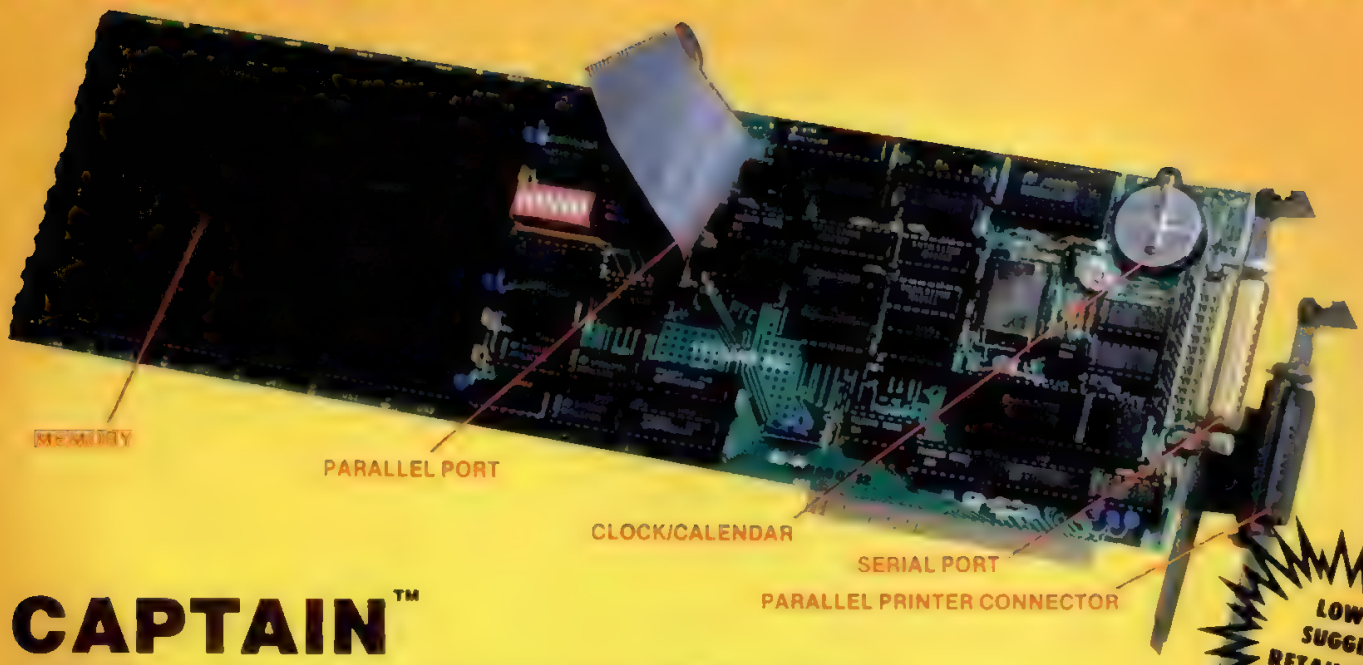

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- **0 to 384K MEMORY** - fully socketed for easy user upgrade in 64K blocks.
- **CLOCK/CALENDAR** - battery-powered to maintain date and time while computer is on or off.
- **SERIAL PORT** - to connect to modem or printer with full IBM PC compatibility
- **PARALLEL PORT** - fully compatible for standard IBM Parallel Printer or compatible printers. Cable and connector included.
- **RAMSPOOLER SOFTWARE (included)** - enables printing to become a background task, freeing your PC for other functions.
- **SPEED DISK SOFTWARE (included)** - simulates high speed disk drive in RAM, from 5K to 512K in 1K increments. 50% faster than a Winchester.
- **AUTOTIME SOFTWARE (included)** - automatically enters correct date and time each time the user powers up the computer.
- **OPTION** - inexpensive PAL chip enables user to restrict availability of information on a 'need to know' basis or to limit access to proprietary software.

LOWEST SUGGESTED RETAIL PRICES

$349 Unpopulated Memory

$389/64K
$470/128K
$551/192K
$633/256K
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WAVE™ & BOSUN™ for your IBM PC/XT

WAVE **$299.00**

BOSUN **$195.00**

WAVE™

$299/64K **$449/192K**
$379/128K **$499/256K**

WAVE fits into a short slot in the IBM PC/XT.

- **64K to 256K MEMORY** - fully socketed for easy field upgrade in 64K blocks.

The following additional features are the same as Captain described above:

- **RAMSpooler™ Software**
- **SpeedDisk™ Software**

BOSUN™

BOSUN fits into a short slot in the IBM PC/XT. The following features are the same as Captain described above:

- **Clock/Calendar**
- **Serial Port**
- **Parallel Port**
- **RAMSpooler Software**
- **Autotime™ Software**
- **PAL Option**
- **Cable and Connector**

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Amazing new resolutions on standard color monitors

***Complete* emulation of IBM's display adapters**

On standard low-scan color monitors:
- 640 horizontal x 400 vertical in 16 colors
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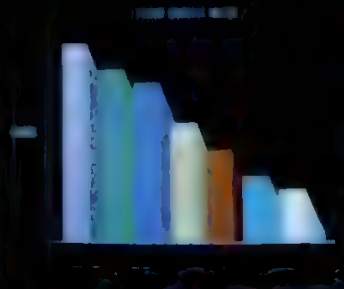
On the IBM Monochrome Display:
- 720 horizontal x 700 vertical
- 25/50 lines of 80 characters

Graphics Master can do much more. In all, over 30 different display modes can be used on standard monitors, and over 25 on the IBM Monochrome Display.

With certain monitors, you can achieve super-high resolutions like 512 horizontal x 420 vertical in up to 16 colors *without interlace.*



Graphics Master is equipped with a full 128K of on-board display buffer memory. In low-resolution modes, extra memory isn't wasted. You can divide it up into alternate display screens or use it for general data storage.

Graphics Master retains complete compatibility with the IBM Monochrome and Color/Graphics Adapters. Use it to accompany or replace one or both of the IBM cards.

Graphics Master will run with all IBM software for the Personal Computer, including BASIC's graphics commands.

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OPEN ACCESS™ Reads, Writes It Paints in 3-D, Keeps and

Manage Your Information.

HQ just called. For 1984 they want revenues of 10 million and profits of 1 million. They want the sales history and a forecast—today—in Chicago.

I waste no time. With the information manager, I quickly combine and retrieve information from the (1) sales department file, (2) marketing department file, and (3) manufacturing department file. With the push of a button, it all gets sent to the electronic spreadsheet.

Project the Figures.

Inside the spreadsheet, I must now calculate the sales volume and advertising expenditures to meet HQ's 1984 goals. But, if I can play the "what-if" game, finding the right combination of figures could take hours.

Luckily, the spreadsheet I'm using has Goal Seeking. This way, I can enter my two target values and let the spreadsheet calculate the right combination of sales volume and advertising. This way, I know I've got the right values—

Graph Your Results.

I've learned that HQ doesn't like wading through reports to get the bottom line—they want to see it as clear as day. So, I'll move the spreadsheet results directly into the graphics module. In a few keystrokes I have a mountain of raw data distilled into a bright, three dimensional color bar graph.

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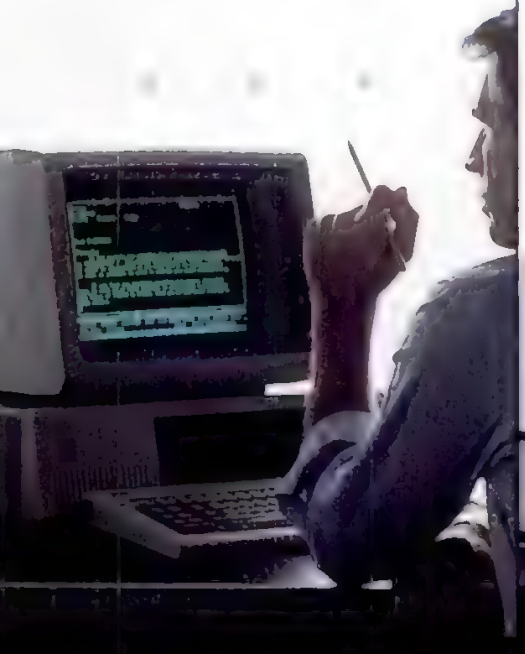
and does Arithmetic. Your Appointments Talks to the World.

Write Your Summaries.



Fortunately, this word processor is powerful enough that I can quickly call up last year's sales report, edit the changes, copy in the spreadsheet model, and include a command to print the graphs at the end of the report.

Now, I can rewrite the critical lead paragraph to get the wording just right, perform a global search and replace to update the year, and block margin the paragraphs for a professional appearance. 9:43 am. Finished!

Communicate With Your Offices.

After a quick review of all the work done, I thank my lucky stars for the powerful communication module. This allows me to simply display HQ's phone number from a list and with the push of a button, my intelligent modem calls the number. Then, a few keystrokes and—zip—I've sent it all to Chicago by electronic bit stream. Time 10:47. I just saved 4½ days!

SPI

10240 Sorrento Valley Road
San Diego, California 92121
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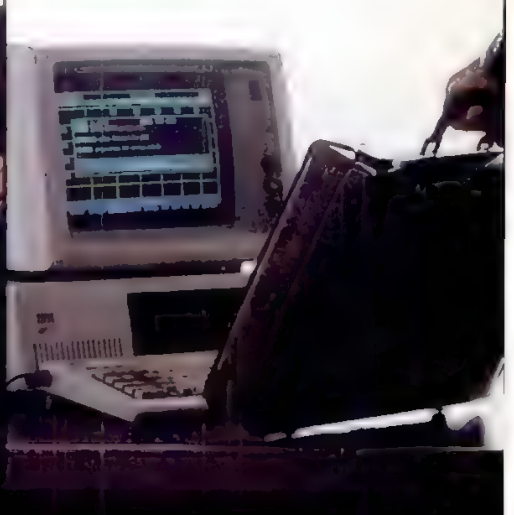
And Still Keep Your Appointments.



I expect the quality of this report to raise some eyebrows at HQ. So, I'll schedule the rest of today off since I've already finished a week's work. Fortunately, my appointment scheduling system reminds me of my dentist appointment at 4:30. I'll also schedule a briefing at 9:00 am tomorrow for the sales staff and my secretary can use the rotary card file to call everyone on the list. Well, I'm off for the golf course—Good-bye!

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built-in editor	YES	NO	NO
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PC User Groups

This list is a partial directory of PC user group names and addresses. Use this listing to locate other PC aficionados in your area or around the world.

MARYLAND

I/O News
c/o Data Unlimited
9 Congressional CT.
Baltimore, MD 21220

Lutherville User Group
c/o Bob Roswell
1516 York Rd.
Lutherville, MD 21093
(301) 337-5555

Baltimore IBM PC Users Group
1910 Trout Farm Rd.
Jarrettsville, MD 21084

MASSACHUSETTS

SIG/86
c/o Joseph Boykin
47-4 Sheridan Dr.
Shrewsbury, MA 01545
(617) 845-1074
(617) 366-8911, ext.-3216

IBM PC Users Group
The Boston Computer Society
P.O. Box 307
Wellesley Hills, MA 02181

Massachusetts IBM PC Users Group
c/o Robert L. Ward
P.O. Box 1014
Heritage Sq.
Belchertown, MA 01007

MICHIGAN

Southwestern Michigan IBM PC Users Group
c/o R. K. Schmitt
2320 Crosswind Dr.
Kalamazoo, MI 49008
(616) 349-5381

Darrell Frappier
South Eastern Michigan Computer Organization IBM SIG
P.O. Box 02426
Detroit, MI 48202
(313) 532-1390

Grosse Pointe IBM PC Users Group
c/o Michael S. Skaff, Ph.D
585 Saddle Ln.
Grosse Pointe Woods, MI 48236

uNKNOWN pERSONAL cOMPUTER oRGANIZATION
c/o Dick Janson
8902 Bath Rd.
Laingsburg, MI 48848
(517) 675-7453

MINNESOTA

Minneapolis User Group
c/o Peter LeNeau
100 N. 6th St.
Minneapolis MN 55403
(612) 339-3233

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PC will publish a periodic listing of PC user groups and their activities. Drop a line to Club News, *PC*, One Park Ave., New York, NY 10016. New groups and address changes are shown in **boldface.**

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CLUB NEWS

Twin Cities PC User Group
P.O. Box 3163
Minneapolis, MN 55403

MISSOURI

Columbia PC Users Group
c/o Jennifer DuPont
1560 Daniel Boone Blvd.
Columbia, MO 65201
(314) 449-7316

Kansas City IBM PC Users Group
c/o Bill Meeker
6020 Walnut St.
Kansas City, MO 64113
(816) 444-8709

IBM PC Users Group of St. Louis
c/o Dave Zumbro
P.O. Box 837
St. Louis, MO 63188
CompuServe #74405, 1252

NEW HAMPSHIRE

Portsmouth PC Users Group
c/o Cynthia W. Harriman
57 South St.
Portsmouth, NH 03801
(603) 436-1608

NEW JERSEY

Central Jersey IBM/PC
Information Exchange
c/o Howard Dean
P.O. Box 8280
Red Bank, NY 07701
(202) 842-5800

Personna Computer Association, Inc. The Int'l Association for Users of the PC
c/o Larry Collison
P.O. Box 759
Point Pleasant, NJ 08742
(201) 840-0300

North Jersey IBM PC Club
P.O. Box 497
New Providence, NJ 07974

The Amateur Computer Group of New Jersey
c/o Carol A. Ziemba
IBM PC Users Group
P.O. Box 319
South Bound Brook, NJ 08880
(201) 467-2000

NEW YORK

QNPC
c/o Nathan Chao
Dept. of Computer Technology
Queensborough Community College
Bayside, NY 11364
(212) 631-6207

East Coast Club
c/o Richard Parker
ComputerLand
79 Westbury Ave.
Carle Place, NY 11514

NYPC: The NY IBM Personal Computer Users Group
80 Wall St., #614
New York, NY 10005
(212) 533-NYPC

The Manhattan IBM Micro Club
c/o Helaine Head
360 Central Park West
New York, NY 10025
(212) 222-9027

IBM PC Users Group of the New York Amateur Computer Club, Inc.
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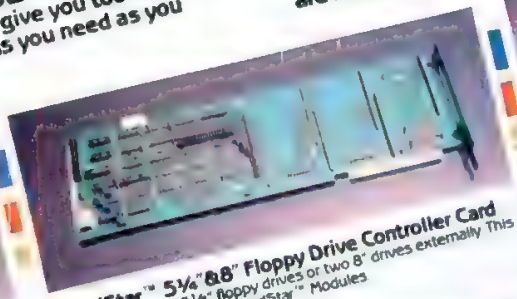

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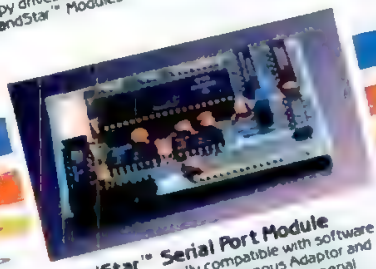

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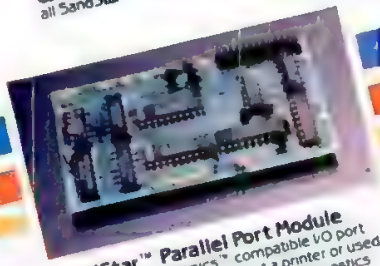

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This module interfaces your PC to any SASI (or SCSI) compatible device such as the Xebec Hard Disk Controller

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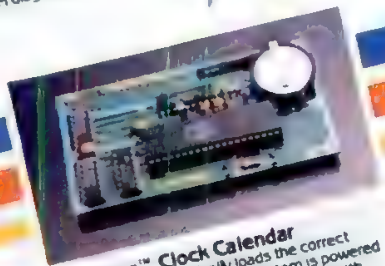

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There's an "uh-oh" command called Undo. Make a mistake? Or just want to experiment? Hit Undo.

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MS is a trademark of Microsoft Corporation

Mouse. Finally.

Word undoes your last change and remembers things the way they were.

Word does windows. Up to eight, to be exact. So you can transfer or edit between eight different documents. Or between eight different pieces of the same document.

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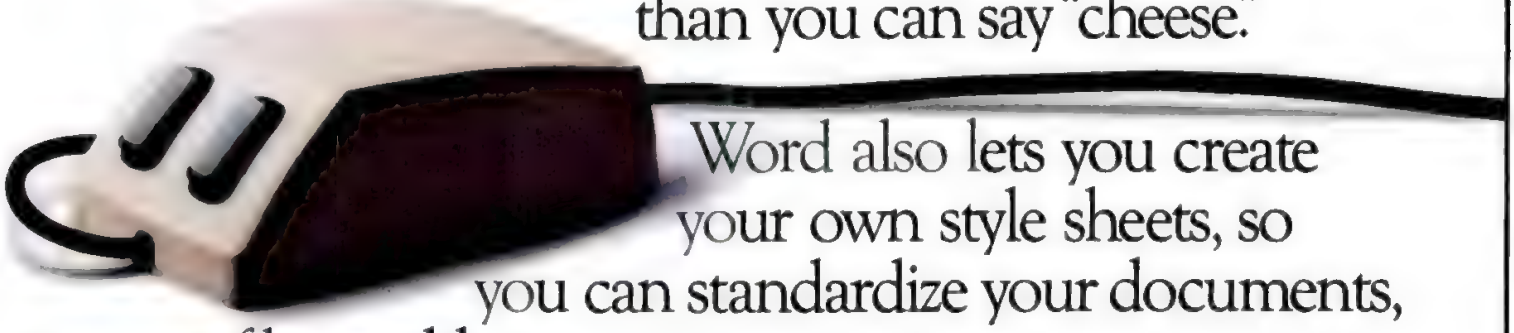

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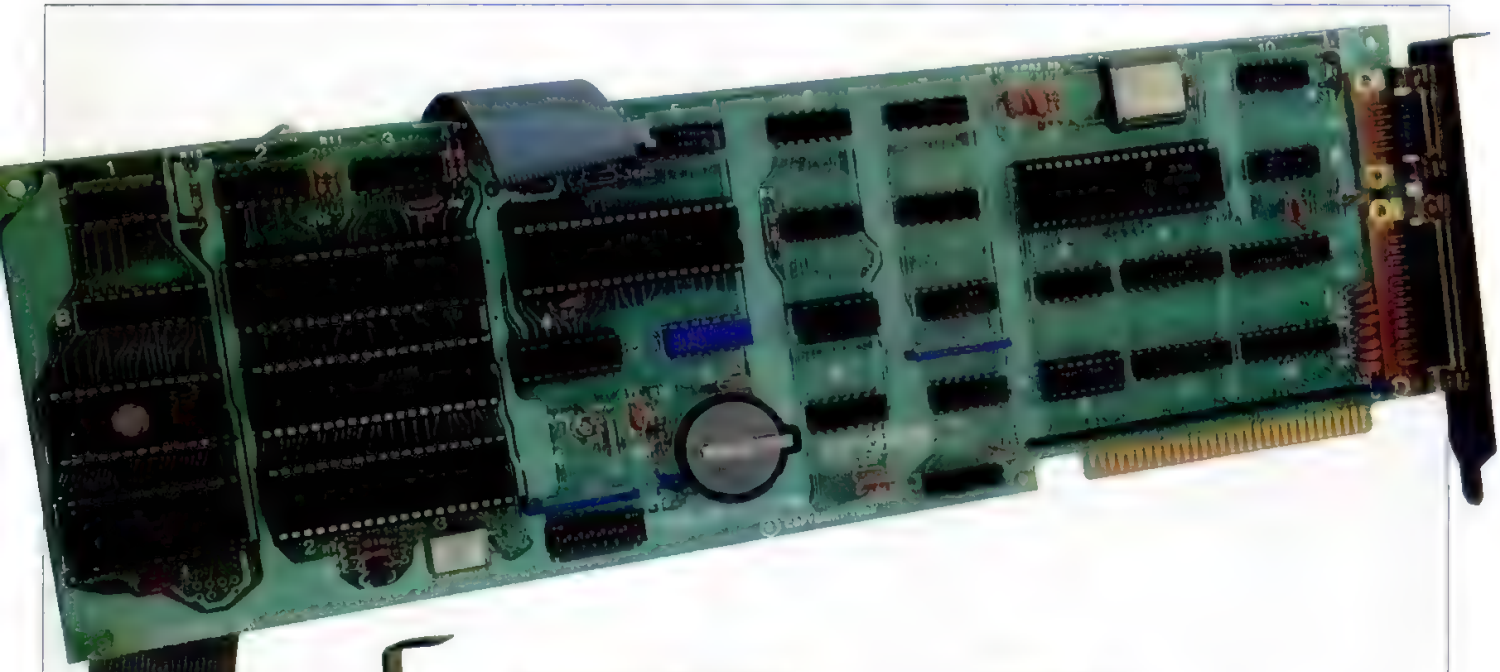

STANDARD FEATURES

- IBM compatible **Parallel Port** (port 1 or 2)
- IBM compatible Asynchronous **Serial Port** (port 1 or 2)
- Converting **Parallel to Serial** port with **Spooler** buffer
- DOS compatible **Clock-Calendar** with lithium **Battery Back-Up**
- **Piggyback** connection port for memory
- **Printer Switcher**, parallel or serial
- Software on **Diskette** for clock and diagnostics
- Full 2 year warranty

OPTIONS (User installed)

- Piggyback memory socketed for 256K with 64K-256K installed
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- **8K Spooler** memory (2K is standard)

OPERATION

The user may switch the printer output from the parallel port to a 2nd serial port by merely flipping a switch on the **Switchport** board rear plate.

ORDERING INFORMATION

SP-X-YYY-ZZ

SP=Switchport Board

2=2K Spooler (Std.)
8=8K Spooler

000=No memory (Std.)
064=64K installed
128=128K installed
192=192K installed
256=256K installed

00=No IBM Typewriter Cable (Std.)
50=Cable for IBM 50 or 60 Typewriter
65=Cable for IBM 65 or 85 Typewriter
75=Cable for IBM 75 Typewriter

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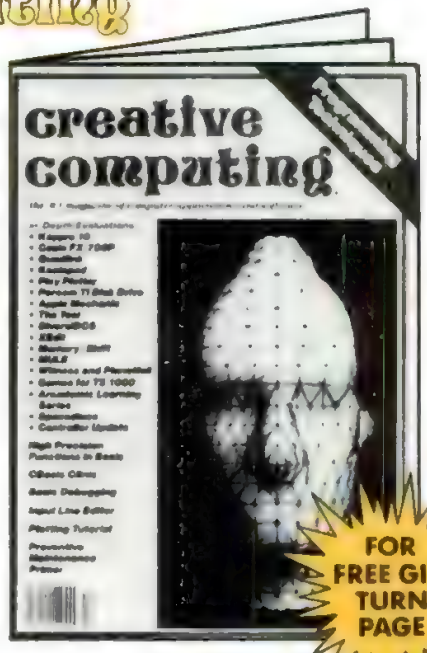

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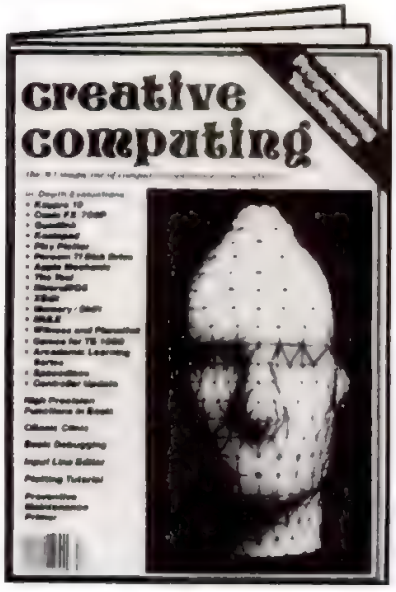

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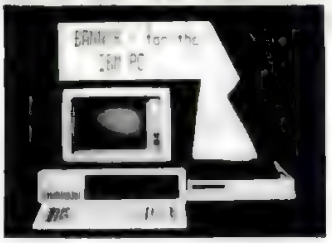

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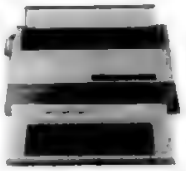

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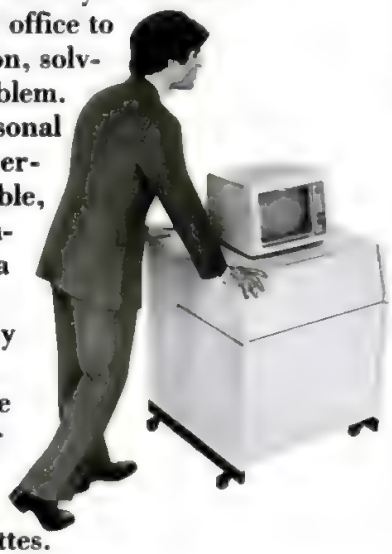

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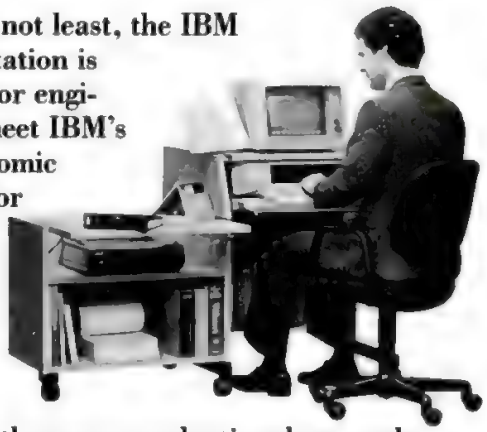

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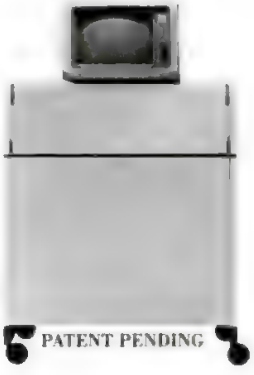

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MARK ZACHMANN

PC Tutor

Addressing WordStar

After I wrote an explanation of how to customize *WordStar* by making changes to memory locations through DEBUG, several readers wrote back and asked me for a compendium of *WordStar* addresses. If you're looking for such a list, here it is. If you aren't sure how to use this information, see my explanation in the article "Custom Control of *WordStar*," *PC*, Volume 2 Number 4.

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(continued)

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77F	Ctrl-Q		"	0	
784	Ctrl-W		"	0	
78E	Ctrl-R		"	[illegible]	"
	Alternate Font				
76B	Ctrl-A		"	0	variable
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- Sort the report in any sequence. Up to 5 sort fields allowed. You can even sort on a field which does not appear on the report.
- Print reports and/or write them to the disk LOG file for later printing.

Sort Data File

- Sort the data file in any sequence you want. Up to 5 sort fields allowed. Change the sort sequence and/or sort data file as often as you want.

Other Features

- Program is completely menu driven. All options are shown clearly. Very little to memorize. The keyboard function keys are carefully selected and designed into the program to fit the human hand.
- Most commands are 1 character long.
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CIRCLE 133 ON READER SERVICE CARD

ADDRESS (in hex)	PARAMETER (flags: FF=true, 0=false)	UNITS	DEFAULT VALUE	LENGTH (in bytes)
	Message Times			
2CF	Short Delay	seconds	1	1
[illegible]	Medium-Short Delay	seconds	4	1
2D1	Medium-Long Delay	seconds	8	1
2D2	Long Delay	seconds	10	1
2D3	Redisplay Delay	seconds	9	1
2DB	Disk Reset	flag	0	1
2DC	Default Drive	drive #	1	1
360	Initial Help Level	level #	3	1
361	Initial Help Message	flag	FF	1
362	Insert Mode ON	"	FF	1
363	List Directory	"	FF	1
37F	Left Margin	column	0	1
380	Right Margin	column	40	1
385	Word Wrap ON	flag	FF	1
386	Justification	"	FF	1
387	Variable Tab	"	FF	1
388	Soft Hyphen	"	FF	1
389	Hyphen Help	"	FF	1
[illegible]	Print Control Display	"	FF	1
38B	Ruler Line	"	FF	1
[illegible]	Page Break Display	"	FF	1
38D	Page Break Suppress	"	FF	1
38E	Line Spacing	lines	1	1
393	Column Move Mode?	flag	FF	1
395	Dot Command Character	char	[illegible]	1
396	Nonbreak Space	char	2E	1
39A	Hyphen Criterion	# of spaces	[illegible]	1
3CA	Disk File Output?	flag	0	1
3CB	Use Form Feeds?	"	0	1
3CC	Suppress Page Format?	"	0	1
3CD	Pause?	"	0	1
3D3	Omit Page Numbers?	"	0	1
3D4	Microjustify?	flag	FF	1
3D5	Bidirectional Printing?	"	FF	1
367	Paper Length	lines 1/48"	42 210	2 (word--least significant byte first)
368	Top Margin	lines 1/48"	3 018	2 (word)
373	Bottom Margin	lines 1/48"	8 040	2 (word)
37B	Standard Pitch	flag	FF	1
37C	Default Pitch	1/120"	0C	1
37D	Alternate Pitch	1/120"	0A	1
37E	Page Offset	lines	0	1
392	Non-Document Mode	flag	0	1
746	Carriage Return Without Line Feed	flag	0	1
747	# Of Strikes For Boldface	flag	2	1

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CIRCLE 190 ON READER SERVICE CARD

PC TUTOR

checks will fail—the hard disk doesn't even take the same BIOS call. The back-up programs you mentioned work only on diskettes, not on RAM disks or hard disks. Although they may be able to read program information off a copy-protected disk, there is no general way to make the computer simulate the results that the copy protection scheme is looking for.

A Choice of Sectors

Q: Because I've had trouble reading the new 9-sector disks with my disk drives, I decided to format all my disks to have 8 sectors. Since then I have had no problems. However, my doing this raised a question.

The DOS 2.0 manual says that the volume parameter /V cannot be used with the sector parameter /8 of the FORMAT program. However, if I use the syntax

```
FORMAT B: /S/8/V
```

there is no error message, and PC-DOS will allow me to put a volume label on the disk. The disk can be read and listed with the volume label, so there appears to be no problem.

Is there really a place for a volume label on an 8-sector disk, or is it being written in some area where it will be likely to cause trouble later on?

Charles W. Therrien
Lexington, Massachusetts

A: This is a very interesting question, since it seems to point out a bug in PC-DOS 2.0. According to the manual, you cannot use the /V option with the /8 option. If you try entering:

```
FORMAT B: /8/V
```

you will get an error message. But if you add the /S option (which adds the system files to the disk), this seems to make the FORMAT program allow you to add the volume label.

As far as this method causing trouble, you need not worry. The volume label is actually just a file indentifier in the DOS directory. It will not harm anything to use a volume ID. Even with PC-DOS 1.1 you will not have trouble reading from or writing to such a disk.

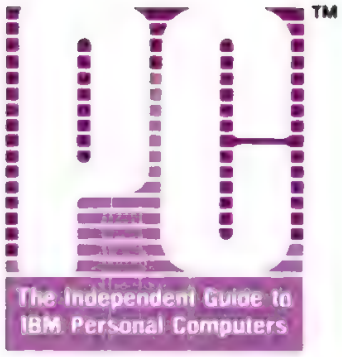
PC-DOS 2.0 differs from 1.1 by defining a few more bits in the file control block (which contains the pointers in the disk directory). These include the volume ID bit, the subdirectory bit, and the archived bit, which is used for backup purposes. At worst, having these bits turned on will confuse some PC-DOS 1.1 utilities or programs, but without causing any lasting damage. Usually, PC-DOS 1.1 programs will ignore these bits.

There are two main differences between 8-sector and 9-sector disks. The first, of course, is that 8-sector disks have only 8 sectors per track. This means that 9-sector disks have 12.5 percent more storage per side. The second is that 9-sector disks have the sectors placed on the disk in a slightly different manner.

As a result, you cannot read or write to 9-sector disks using PC-DOS 1.1. PC-DOS 2.0 will read or write to either type of disk. The operating system automatically determines which type of disk is inserted into the drive.

IBM's original 8-sector format made a quite conservative use of disk storage. Some manufacturers actually use 10 sectors per track. Greater density has attendant problems, however. The more sectors you have per disk, the more critical it is that the disk be well made and that your drives be well aligned. Physical constraints limit the maximum number of sectors, since sectors are not allowed to overlap each other on the diskette. Using fewer sectors per track just causes more empty space between each sector, which helps compensate for misaligned drives. ■

The PC Tutor solves practical problems and explains points of general interest. If you'd like to see your question answered here, drop a line to PC Tutor, *PC Magazine*, One Park Avenue, New York, NY 10016.



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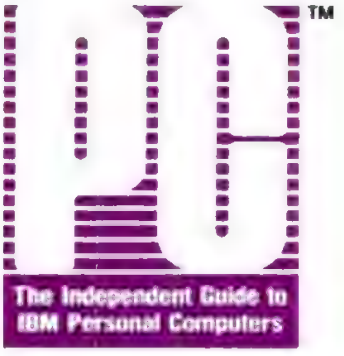

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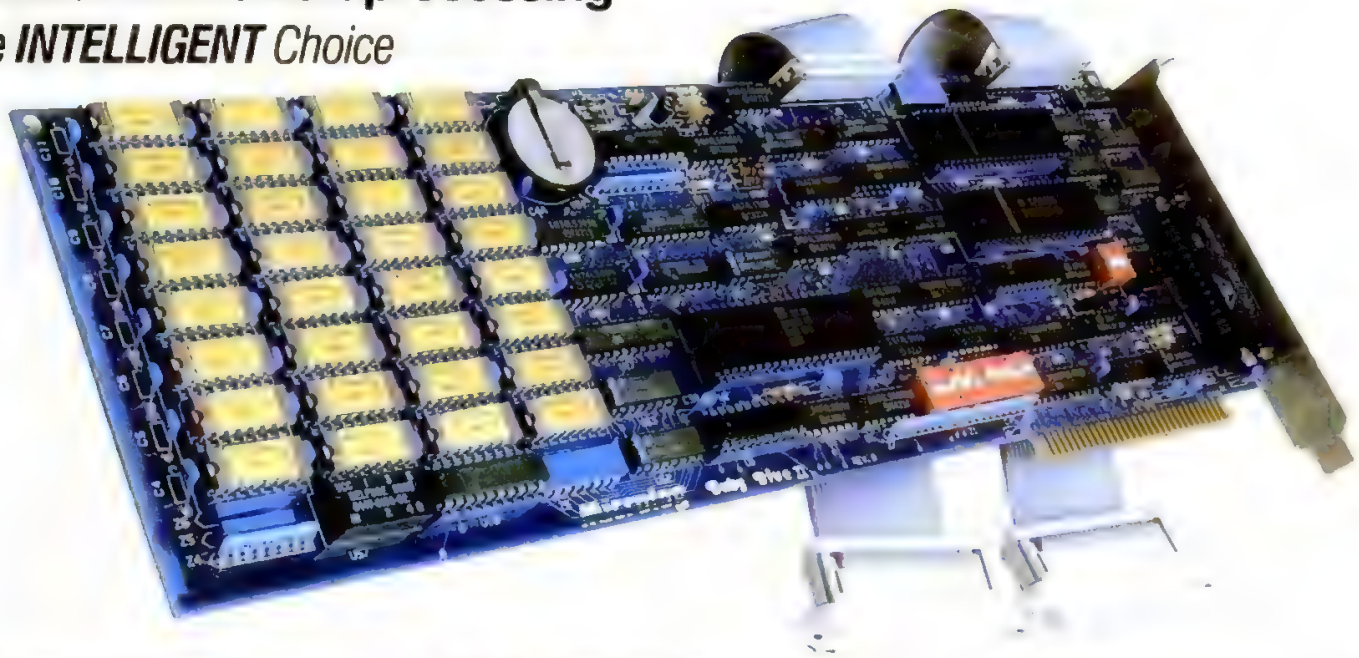

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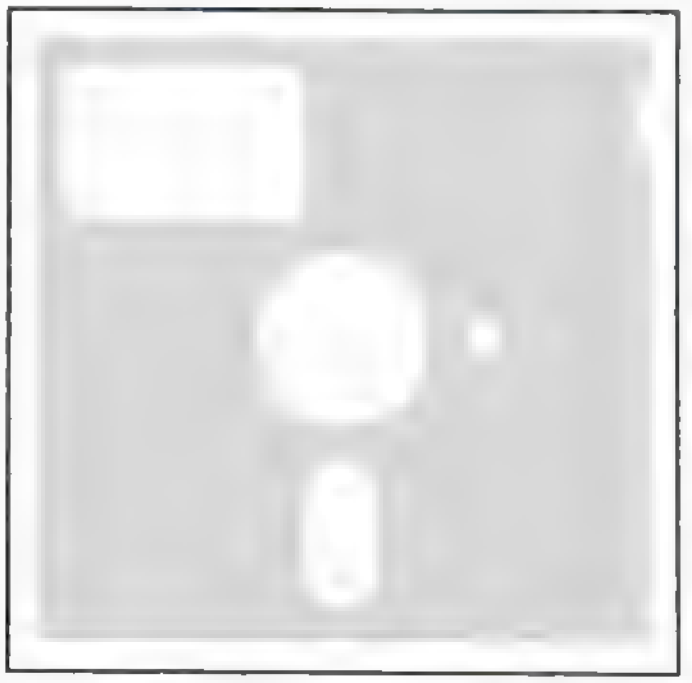

In last issue's column (see "Meet The New APL," *PC*, Volume 3 Number 3), we discussed how APL has become a powerful, easy-to-use language for the PC. We left you in the middle of a scenario where your boss asked you for a report on the influence of your company's advertising expenses and product prices on its sales revenue over the past 10 years—and wanted it finished by noon.

You went to work immediately, using APL and an IBM PC as your tools. You organized vectors of Advertising, Price, and Sales values into a data matrix, which you called D. Then you created a general function, called CM, which calculates the correlation matrix for any data matrix. You accomplished all this by writing only a few lines of code, since APL is such a concise language. Now we'll show you how to do a more complicated statistical analysis of the data and demonstrate the power and flexibility of APL.

Multiple Linear Regression

You decide to investigate the multiple linear regression (MLR)—the least-squares relationship where Sales is the dependent variable and Advertising and Price are independent variables. In standard mathematical notation, you need to fit the values to the following equation:

$$\text{SALES} = b_0 + b_1\ \text{ADVERTISING} + b_2\ \text{PRICE}$$

To use this equation in APL, you need to designate the dependent-variable vector for Sales and the independent-variable matrix X for Advertising and Price values. Also include a column of ones as values for b_0. It's a three-step solution:

```
Y←D[;3]

X←D[;1 2]

Y⌹1,X
```

The output provides the values for b_0, b_1, and b_2.

```
10.7021577 10.1512204 ¯2.07640608
```

These coefficients allow you to predict that spending a million more dollars on advertising will increase sales by slightly over $10 million. They also show that price and sales are negatively related.

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By Larry Joel Goldstein

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Written by the same author as the present best-seller, "IBM PC: An Introduction to the Operating System, BASIC Programming, and Applications, Revised and Enlarged", this volume is a must for both the first-time user and the accomplished programmer of the PC*jr*. Included within the self-study format are chapters on:

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- Introduction to DOS
- Introduction to PC*jr* BASIC
- Controlling the Flow of Your Program
- Easing Programming Frustrations
- Word Processing
- Computer Games/Computer Generated Simulations

The PCjr Specific library from Brady is available at Computerlands, IBM Product Centers, Sears Computer Centers, Entré Computer Centers, B. Dalton Booksellers, Waldens, Crown Books and other fine bookstores and computer dealers. If you are unable to find a copy, call 800-638-0220 toll free for information.

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CIRCLE 157 ON READER SERVICE CARD

Although this was quick and easy, you decide to write a more elegant, general procedure for MLR, since you expect to perform this calculation often. You create three separate APL functions: one that will input data interactively (called IMLR), a second that will perform calculations automatically (called CMLR), and a third that will print results in an attractive format (called PMLR).

Doing It Better

The first function you write, IMLR (see Figure 1), uses a utility that you named INPUT. Notice that any APL functions you create can be called from other functions, just as you could with any APL primitive function.

Your CMLR function (see Figure 2) actually calculates the regression coefficients. You write just one line of code for CMLR, since APL has a built-in function for matrix division. The CMLR function can take XY from the output of IMLR and produce a vector, called B, which contains the regression coefficients.

The last function to write is PMLR (see Figure 3), which accepts vector B from CMLR and produces a neatly formatted table of the coefficients:

```
B0 =   10.70216
B1 =   10.15122
B2 =   ¯2.07641
```

These three functions—IMLR, CMLR, and PMLR—are all you need whenever you perform regression analysis. They can be used singly or in combination. All three can be combined for an interactive solution to your problem, and you can call on it by simply typing:

```
PMLR CMLR IMLR
```

Plotting

To conclude your report, you decide to create a simple plot of your data. Plot is a function (see Figure 4) that plots values for one to six different variables, using the six symbols seen in line eight between the single quotation marks. Plot allows you to specify the height of the vertical scale, but the scale divisions are determined by the maximum and minimum among all the values that are included on the plot. You can use Plot to display the values for Advertising (small circles), Price (asterisks), and Sales (large circles).

```
      B PLOT X,Y
|        o
|         o
|      oo  o
|  ooo
|oo
|
|** *****
|  *     **
|..........
|----.----.
```

While you are not completely happy with the resulting printout, you hope that your boss will notice the deficiencies as well, and approve your plan to create better graphics software that takes advantage of the fact that your implementation of APL—and most other implementations—supports all-points-addressable graphics.

It's almost noon—just about time to make your presentation. By turning to APL, you not only got the job done, but created a number of APL objects—functions and sets of variables—that reside in RAM and can be saved in an APL file. You can arrange and combine them in different ways to be used later.

All of the code in this article was written on the University of Waterloo's implementation of APL, but they should work as written with any IBM PC version of APL. If you've vicariously participated in this story by keying in the listings as your read along, you now have several new APL functions that are ready to put to work. Once you start, you may find it hard to resist spending the rest of the day at your computer, creating new applications for APL—it's A Powerful Language. ■

```
      ∇XY← IMLR ;I;K;N
[1]   ⍝ Interactive Multiple Linear Regression
[2]    'INPUT MLR'
[3]    N←INPUT 'NUMBER OF OBSERVATIONS? '
[4]    K←INPUT 'NUMBER OF INDEPENDENT VARIABLES? '
[5]    '' ◆ 'ENTER  X,Y  VALUES:' ◆ ''
[6]    XY←((I←0),K+2)⍴0
[7]   L1:XY←XY,[1]1,INPUT 'OBSERVATION ',(⍕I←I+1),'? '
[8]    →(N>1↑⍴XY)/L1∇
      ∇Q← INPUT R
[1]   ⍝ input utility
[2]   □←R ◆ Q←⍎(⍴R)↓□∇
```

Figure 1: *Code for a function named IMLR, or interactive multiple linear regression.*

```
      ∇B← CMLR XY
[1]   ⍝ Calculate Multiple Linear Regression
[2]    B←XY[;(⍴XY)[2]]⌹0 ¯1↓XY∇
```

Figure 2: *Code for a function named CMLR, which determines the coefficients of multiple linear regressions.*

```
      ∇Z← PMLR B
[1]   ⍝ Print Multiple Linear Regression
[2]    Z←'B',[1.5](⍴B)↑'0123456789'
[3]    Z←Z,((⍴B),3)⍴' = '
[4]    Z←' ',[1]Z,0 5 ⍕((⍴B),1)⍴B∇
```

Figure 3: *Function PMLR produces a neatly formatted output table.*

```
      ∇Z← S PLOT X ;I;XN;XX;Y
[1]   ⍝ columns of  X  plotted against their indices
[2]   ⍝ S  specifies height of vertical axis
[3]    XX←⌈/⌈/X←(2↑(⍴X),I←1)⍴X ◆ XN←⌊/⌊/X
[4]    Z←(1 0 + S,1↑⍴X)⍴0
[5]   L1:Y←(X[;I]-XN)÷XX-XN
[6]    Z←I⌊Z+I×(⍳0,⍳S)∘.=⌊S×Y
[7]    →((1↓⍴X)≥I←I+1)/L1
[8]    Z←' ∘⌹○×⍬'[Z+1]
[9]    Z←'⌈',Z,[1](1↓⍴Z)⍴'———.'∇
```

Figure 4: *The Plot function prints out a simple chart of variables against their indices.*

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Online With A Special Interest

Once you've logged on to CompuServe's IBM PC Special Interest Group, there are still a few little things you ought to know in order to get the most out of it.

In my column, "Signing On to a SIG," (*PC*, Volume 3 Number 3), I looked at some the features of CompuServe's IBM PC Special Interest Group (SIG) and ran through the process of signing up. As you recall, I left off with a discussion of ordering the manual. In this column, I'll tell you what to expect once you're inside the system.

The first step is to acquaint yourself with CompuServe's Public ACCESS feature by typing GO PCS-30 whenever you see the standard CompuServe exclamation point (!) prompt. Or you can select the Personal Computing Services option from the Main CIS Menu and then choose Communications from the submenu that follows. Follow the prompts and download the Help list of ACCESS commands. (You need the ACCESS commands because many of them also work on the databases in the SIG.)

You can enter the IBM PC SIG at any time by typing GO PCS-131 at the exclamation point prompt. This will take you to the entry "page" of the SIG. Once there, you'll be asked for the name you want to be known by in the SIG. After you respond, the system will come back with additional information, including the Function Menu (see Figure 1). This menu is designed to let you use the messaging function, and it is common to all SIGs on CompuServe. You can use the Help function for information on how to search, scan, read, and leave messages. (This information is also contained in the SIG manual.)

More Than Meets the Eye

The choices presented on the Function Menu are not your only options. SIGs databases offer technical essays, conference transcripts, and free software. If you want to access these features, enter XA at the Function Menu prompt. Once you do this, you'll be presented with a choice of the numbers 0 through 8 (see Figure 2), though, unfortunately, there will be no information indicating which number signifies which database or what each database contains.

A menu will appear whenever you select a database (see Figure 3). The browse option generates two additional prompts: age and key. The age prompt allows you to limit your browsing to files submitted within a given number of days; you respond by typing in the desired number. The key prompt allows you to search the database by using a key word that indentifies a particular program or file. (When a contributor uploads programs and files to a SIG database, he assigns several key words to its description.) You respond to the prompt by entering your selection. To scan the entire database simply hit Enter.

Once again, however, the selections listed on the menu are not your only alternatives. Selecting the Help option, generates an additional list of commands. And your options don't end there. As mentioned earlier, you may also enter virtually any valid command used in the ACCESS section of the main CIS system.

A Table of Contents

The CAT (for catalog) command is particularly valuable. Typing CAT *.BAS, for example, gives you a list of all files in the database with the extension BAS. If you are interested in free software, become familiar with this command; BASIC programs are always available. Asterisks and question marks operate with CAT just as they do in DOS.

Simply entering CAT and hitting Enter

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will give you a complete Table of Contents of the database (see Figure 4 for a sample listing). As the Catalog scrolls up your screen, pay particular attention to the file names. Once you know the file name, you can command the system to transmit the information the file contains by keying in TYP (for type) or DOW (for download) at the next available prompt.

In most cases, there will be a companion .DOC file containing the documentation and instructions for each program. Other frequently encountered file extensions include: ASM (for assembler), C86 (for C-86 compiler), and PAS (for Pascal). These files are written in their respective languages. To make use of them you need the appropriate assembler, compiler, or Pascal software.

You will also find that many files have .HEX extensions, for example, COLOFF.HEX, UNSQUZ.HEX,

```
1 (L)  Leave a message
2 (R)  Read messages
3 (RN) Read new messages
5 (B)  Read bulletins
6 (CO) Online conference
9 (OP) Change your SIG options
0 (E)  Exit from this SIG
Enter selection or H for help:
```

Figure 1: *A SIG function menu offers more choices than it tells you about.*

```
0 - General Information
1 - User Updates/Fixes
2 - Product Reviews
3 - Standards
4 - Programming
5 - Communications
7 - Fun & Games
8 - Ask the SysOps
```

Figure 2: *The key to identifying the SIG databases. The SIG won't tell you which number is which.*

```
IBM PC SIG Database Access
Use ? for help
XA 0 - General Information:
1 BRO Browse thru files
2 UPL Upload a new file
3 EXI Exit to IBM PC SIG
4 HEL Hel?
5 XA  Change database
Key digit:
```

Figure 3: *SIG database option menu.*

SQUEEZ.HEX, and TXTPRO.HEX. These contain nothing but page after page of hexadecimal numbers, none of which make any sense when you first encounter them. These files are actually one of the

You can use the Help function for information on how to search, scan, read, and leave messages.

slickest solutions to the problem of sending machine-language programming over telephone lines since Ward Christensen invented his XMODEM file transfer protocol.

The Most Important Program

SIG members usually create .HEX files by compiling a BASIC program or producing machine-language files in some other way. Then they run a program against these files that converts them to hex listings and upload the result to the SIG. The key to unlock these files is this same conversion program. The program is called CVTHEX.BAS (convert HEX), and it can convert any .HEX file into either a .COM or a .EXE file, or vice versa. It was written by Terry Davis and is available in the programming database (XA4). (Note: Don't worry about the checksum that appears at the end of a .HEX file transmission, but be sure to eliminate both the word and the number. A .HEX file can contain nothing but hexadecimal numbers.)

This conversion program is the most important one in the entire SIG, but unfortunately, no formal mechanism exists to tell new SIG members about it. You should download both this BASIC program and its companion .DOC file as soon as possible. At the same time, download the file called CVTHEX.HEX. The BA-

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TELECOMMUNICATIONS

SIC version will work on any .HEX file, but it's slow. So CVTHEX.HEX should be CVTHEX.BAS's first customer. Use the BASIC version to convert the .HEX version into an .EXE file. Then put the BASIC version away and use the .EXE file henceforth.

During the same on-line session, you should also download some .HEX files so that you'll have something to run your new CONVERT.EXE against. TXTPRO.HEX in the Programming database is a good choice. This utility automatically strips the control codes in a *WordStar* file, converting it into simple ASCII text. You also might try TUNE.HEX, which you find in the Fun and Games database. Once this is transformed into an .EXE file, type TUNE n.n at your DOS prompt to make your computer play one of five tunes at one of eight speeds.

The SIG's conversion program is the most important one, but no mechanism exists to tell members about it.

A Final Word

It's important to keep in mind the cooperative nature of any SIG. No one can fault a new user or a nonprogrammer for exploiting a SIG to the fullest. But once you've gotten your feet wet, contribute something yourself. If you've solved a tricky peripheral interface problem, discovered a bug in a commercial program, or found a reliable source for inexpensive disks, share your knowledge. Send a message to the SysOp. Post a notice for everyone to read. Or upload a text file to the appropriate database. The IBM PC SIG on CompuServe has a great deal to offer. And the more you put into it, the more you—and everyone else—will get out of it. ■

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Keying In To Computer Crime

Pirates, mudballs, and malicious hackers—these characters are all part of a new breed of criminal that's using computers to do modern-day bootlegging, stealing, and vandalism.

What is the profile of a computer criminal? Just look at the person standing next to you at the newsstand leafing through the computer magazines, or the teller at your bank, or the person in the office next to you at work. It could be anyone.

Computer crime, technically, can be divided into three categories—malicious "hacking," software piracy, and the use of big computer systems (usually) to perpetrate crimes.

The Impact of War Games

The movie *War Games* was a mixed blessing in the war against computer crime. On the negative side, the movie's teenaged star was portrayed as an adventurous whiz-kid, not as a criminal. On the positive side, the movie alerted the public to the problem of illegal computer hacking and highlighted how easy it is to penetrate even a relatively "secure" system.

A hacker is someone who spends many hours a day in front of a computer terminal. Not all hackers are criminals, of course. However, a few choose to penetrate and "wander" through outside computer systems. Some hackers are vandals who purposely disrupt a system, while others just don't know what they're doing and accidently crash it. In any case, a hacker who sneaks into someone else's computer system is clearly trespassing and thereby engaging in a criminal act.

Illustration: Marc Taffet

A malicious hacker can be very costly to the victim. Don Parker, of Stanford Research Institute, has stated that illegal hacking can cost a victim company as much as $500,000 per incident in terms of staff time spent detecting and removing the interference from the system.

Another problem is the "kiddy hacker," a young computer trespasser who not only is hard to detect, but once discovered, is almost impossible to prosecute. The juvenile court system may treat these cases lightly, and consequently there is little to dissuade computer-wise children from hacking.

Software Piracy

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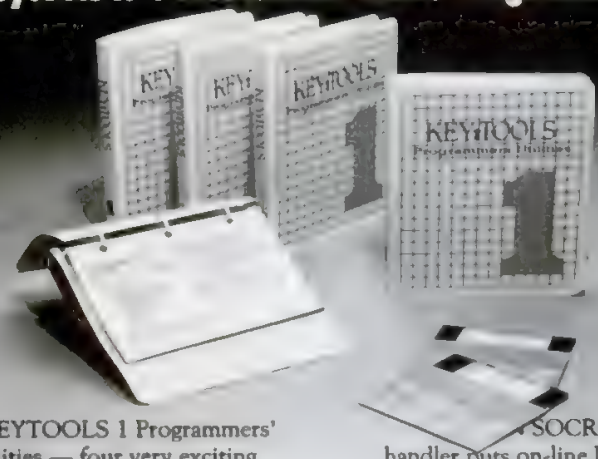

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ISSUES

occurs when software is copied without permission of the owner. The courts are beginning to apply laws already on the books to software bootlegging, but the rights of software manufacturers and consumers are still unclear.

The benefits of federal copyright protection include national protection against copying for the life of the author plus 50 years, and the availability of quick injunctions against copyright infringement.

The problems associated with software copyright enforcement are staggering. A major complication is that a consumer can make legitimate copies: Software companies do, after all, encourage users to make backups, and some programs won't operate unless they are open systems and therefore easy to copy.

Software developers are currently testing the legal theory that breaking the cellophane wrapper on their product binds the purchaser to the enclosed contract, which states the conditions under which legal copies can be made.

Software developers and marketers follow a multitiered approach to protecting software. First, they engage in extensive litigation against all types of copyright infringement. Targets include computer clubs that illegally distribute program copies to their members and corporations that purchase one copy of a program and then illegally pass out copies to their employees. Suits are also being brought against wholesalers and retailers who make bootleg copies for customers.

Software producers have also taken economic steps by keeping the cost of software to a minimum. Customer service is tied to a serial number so that only legitimate users can receive service. In addition, user manuals are printed in small type on dark paper to discourage illegal copying of the manual itself.

Illegal Computer Use

The third area of computer crime is use of a computer to commit crimes such as embezzlement or fraud. Computer criminals in this category are often middle-

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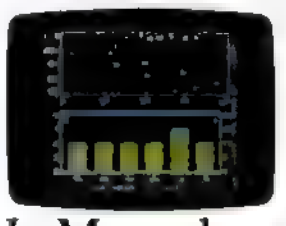

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class, white-collar workers who first learn how to "crack" a computer system and then drift into minor illegal activities. Some go on to commit major computer crimes that may involve millions of dollars.

The term "mudball" is used to describe these computer thieves, who usually work for their victims. Examples of mudballs abound, and talk of mudball capers has resulted in a series of tales describing unusual cases of computer-aided fraud. In one instance, a computer programmer who worked for a bank placed all rounded interest payments below one cent into his own special bank account. Naturally, each account holder did not suspect a loss, but all the rounded cents from all the accounts added up to thousands of dollars a month.

In another case, a computerized payroll system "crashed" like clockwork every other month. The software consultant who had written the program was called in each time this happened to "fix the payroll system." It turned out that the payroll program was designed to crash unless the contract programmer was issued a check for his services. The consultant's service bill would cause the payroll system to run for one additional month. The next month, when the system did not process a check to the programmer, it crashed, and the cycle repeated itself.

A more common type of theft occurs when a computer inventory control system is penetrated by a computer criminal. This thief simply has the computerized inventory control system issue orders for the delivery of goods to bogus companies. The goods are then picked up by the thief and sold for profit.

Employees' illegal use of "extra time" on a firm's computer is another example of illegal computer use. Many employees view nonutilized computer time as "free." Naturally, the employer regards *all* computer time as the property of the firm.

Traditionally, firms have been unwilling to report computer thieves working

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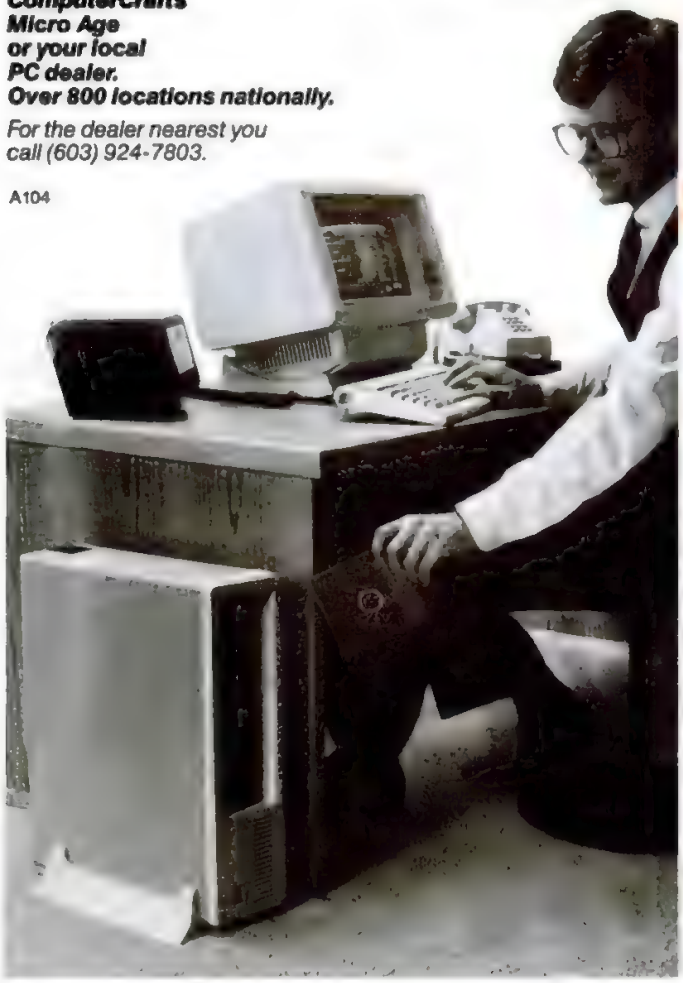

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ISSUES

within their ranks because of fear of bad publicity. Ironically, this type of computer crime is generally detected only by accident or when the thief quits.

Computer Crime Laws

Laws addressing computer crimes are still rare, and most of those that do exist have not been tested in the courts. On the federal level, they are scattered and incomplete. The 414 gang, the group of teenagers that used a personal computer to gain access to sensitive computer files at the Los Alamos Nuclear Research Center, has focused congressional attention on the problem of computer crime. Given this increased interest, improved federal statutes can soon be expected.

At the state level, computer crime laws vary greatly in quality. Approximately 20 states have statutes relating specifically to computer crime. But little prosecution has occurred to date. Each state will have to test the new laws in the courts, and the coverage and enforcement of state computer statutes can be expected to grow as these test cases are resolved. The FBI also has an extensive national computer crime task force.

Computer crime will undoubtedly continue to grow as society becomes increasingly computerized. State and federal laws must be improved and enforced. The educational process, beginning when computers are first introduced to young minds, must stress that computer crime *is a crime*. More importantly, the ethical view must develop that computer crime is wrong. The stakes are getting higher, and computer professionals must take an active role in educating the public on an evolving code of conduct for computer use. ■

Professor John Soma teaches at the University of Denver College of Law and has recently published, with Shepard's McGraw-Hill, a book entitled Computer Technology and the Law. *He formerly was a lawyer with the U.S. Justice Department and worked on the* U.S. *vs.* IBM *antitrust case.*

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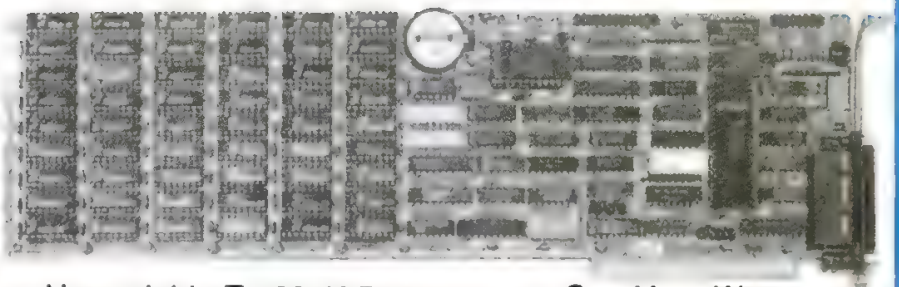

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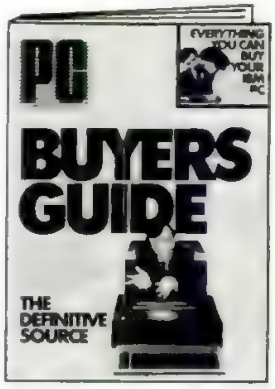

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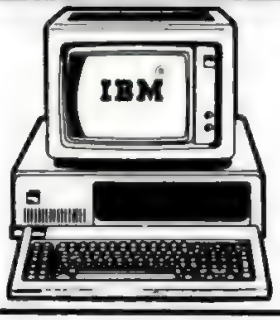

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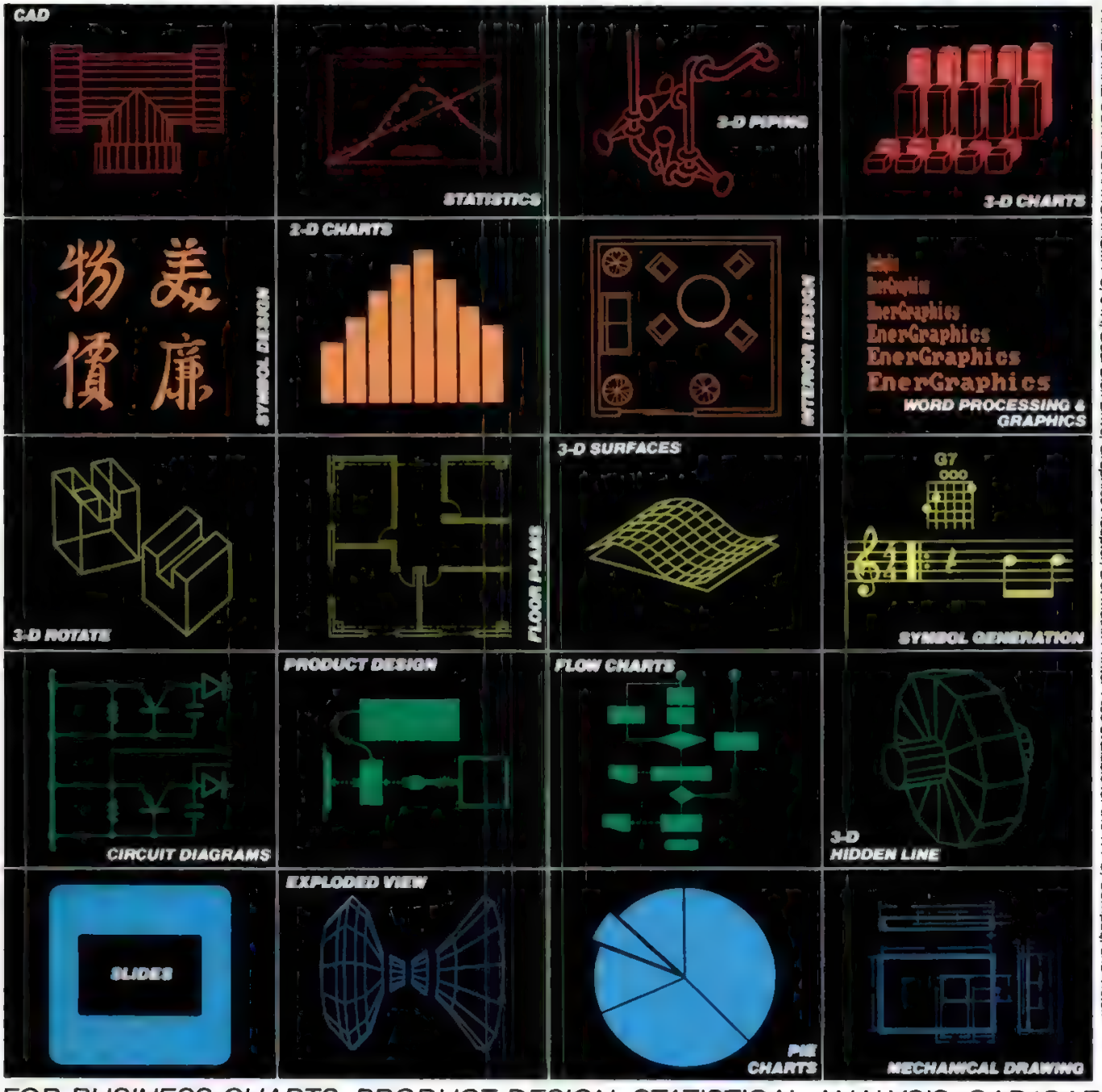

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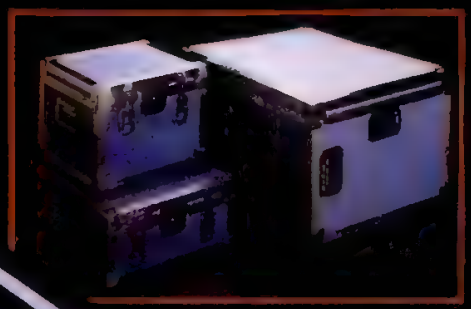

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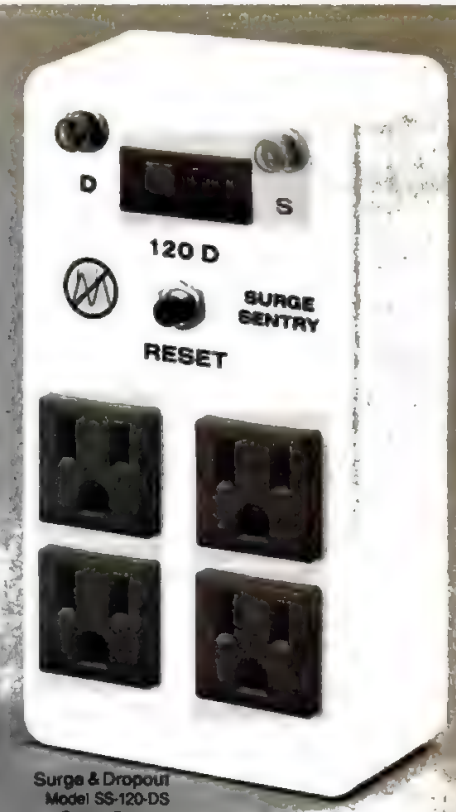

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PC Compatibles

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VisiOn

You may be interested in the new windowing product from the same folks who brought you *VisiCalc*. VisiCorp, maker of the spreadsheet program that changed the shape of software, is now hoping to pull another rabbit out of its hat with *VisiOn Applications Manager Software*, which VisiCorp says will eliminate the gap between applications programs and your computer's operating system. How well does it work? We'll take a look and see.

Friendly Program Editors

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Illustration: Tom Christopher

PC Art Gallery

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Wordivision

PC reviews a broad new, relatively inexpensive, but very impressive word processing system.

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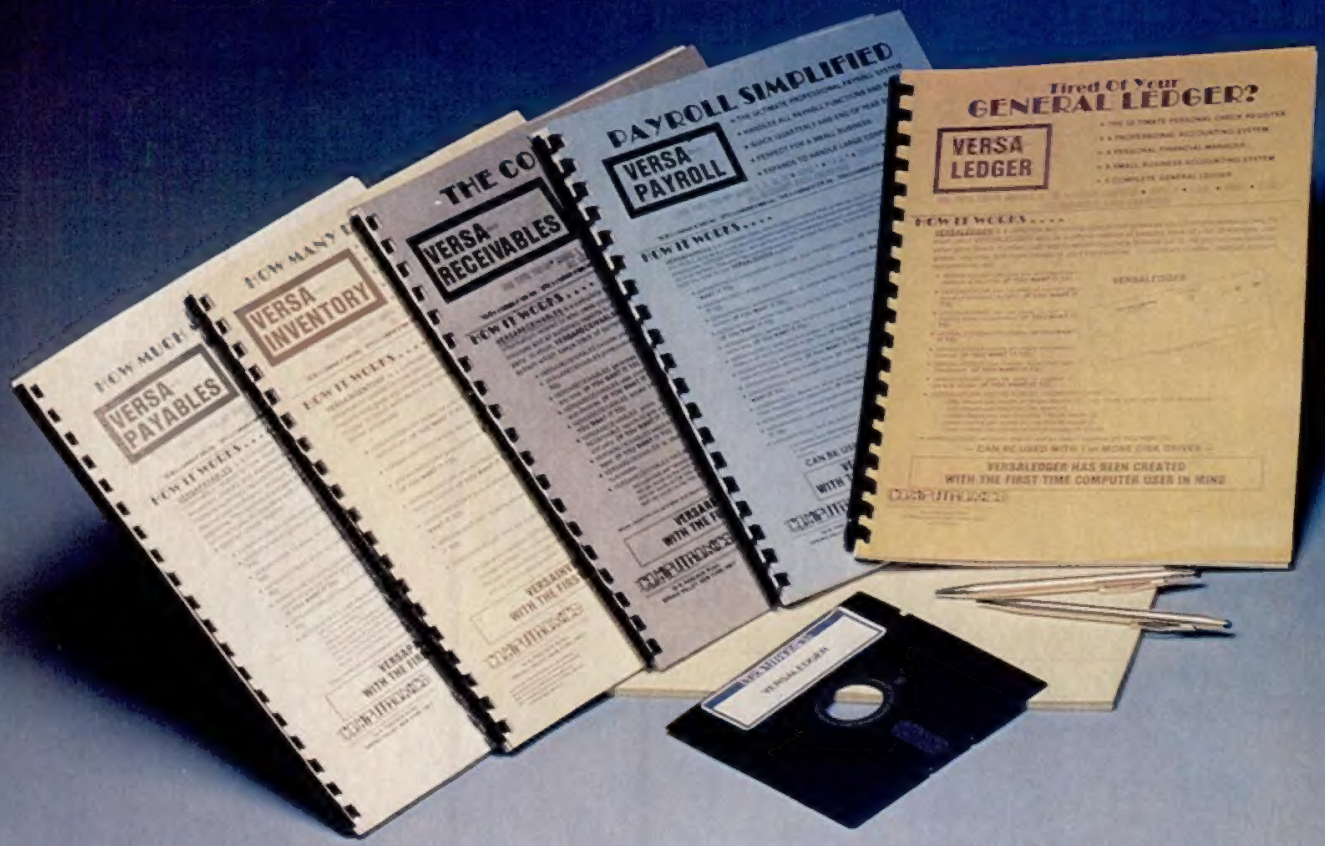

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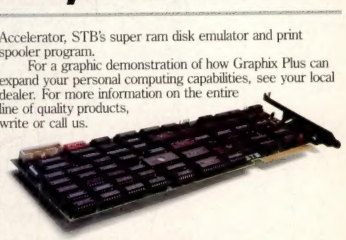

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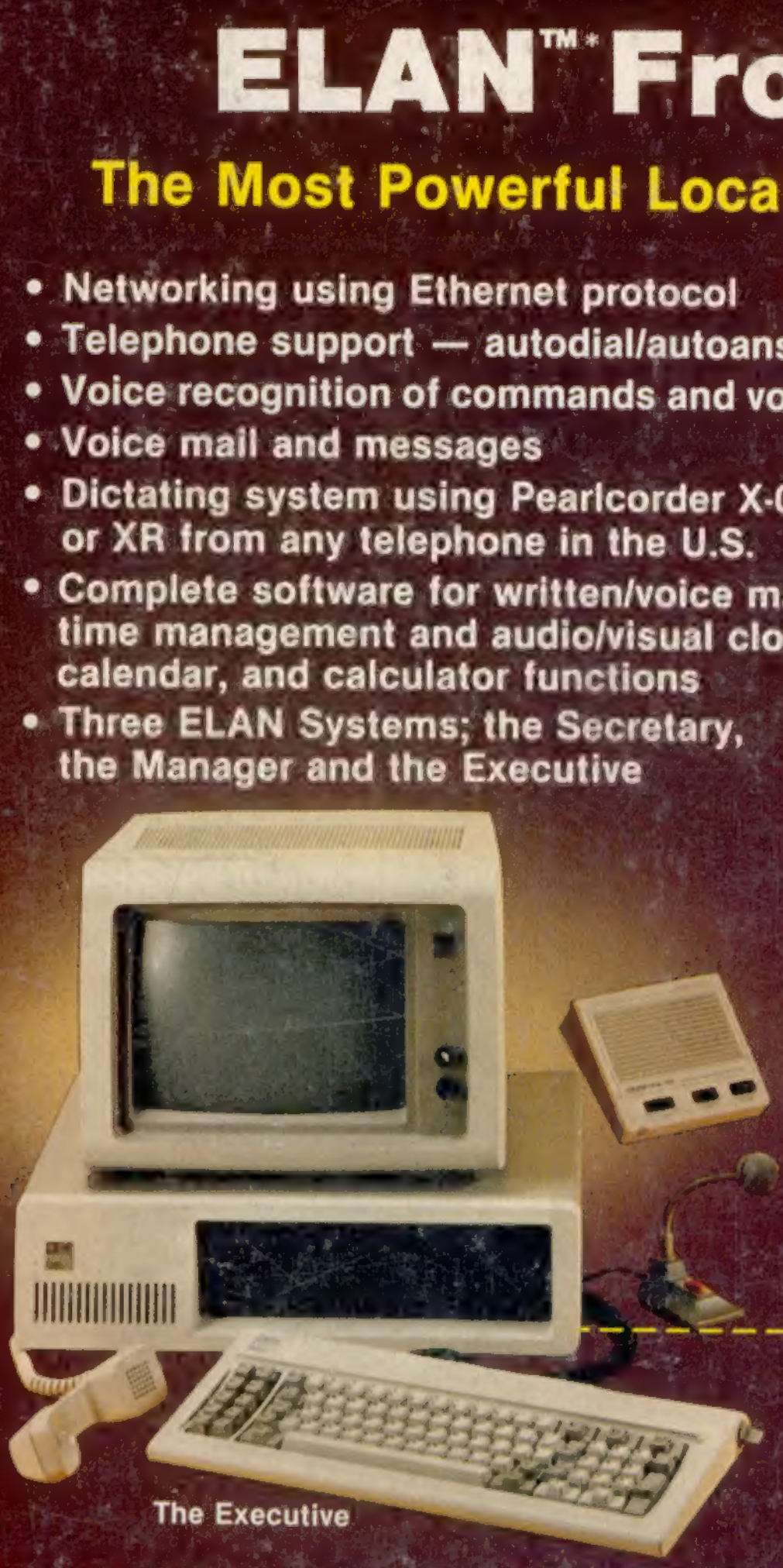

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ELAN is designed to meet your total communications needs, including computer-to-computer (i.e., networking), person-to-computer, and person-to-person communication requirements for data and voice. The industry-standard high speed Ethernet network protocol is employed in ELAN, permitting many IBM Personal Computers to be linked together by ordinary thin coaxial cable. In addition to his own computer, an ELAN system user can access the other devices attached to the cable — such as printers and large disks.

All versions of ELAN include an Ethernet interface with equipment to convert voice into data and back again. This enables the user to give and receive spoken messages from any location as well as store them for later use. In addition, with the Executive version, all ELAN software packages can be operated through verbal commands, through the telephone keypad or through the IBM PC keyboard. The computer can then respond verbally, either by telephone or 'in person'.

*ELAN (Extended Local Area Network) formerly ComNet

The Manager

The MANAGER system adds a modem for telephone data communications and by adding a separate handset, will permit voice communications. The modem enables the MANAGER to receive unattended voice and data from any telephone in the U.S. Also, the MANAGER can accept commands through decoding the tones from the telephone keypad.

The EXECUTIVE is the most complete implementation of ELAN, adding computer recognition of spoken commands. An executive might phone the PC to leave or retrieve messages or request specific information. The PC, in a spoken voice, can request a user's access code or prompt the user for a command. The executive can respond either by pushing buttons on the telephone, or by actually speaking back to the computer.

The SECRETARY is the basic ELAN system. It includes an Ethernet interface and all other ELAN features except modem and voice recognition.

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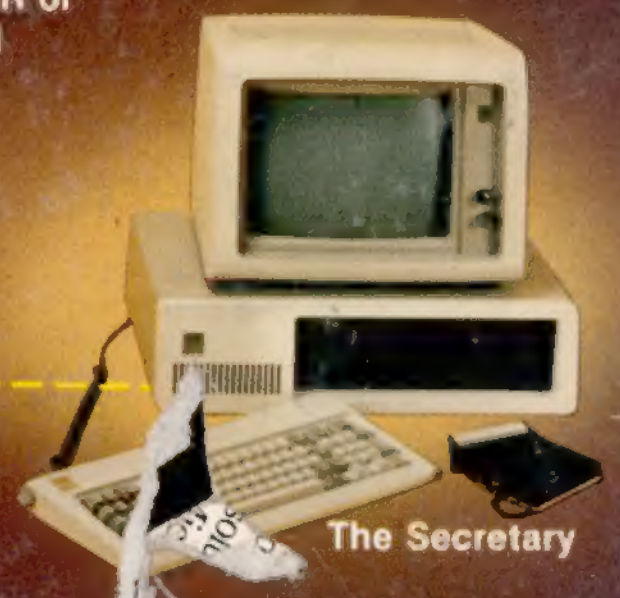

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